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Editors

R. C. BENEDICT

E. J. WINSLOW C. A. WEATHERBY

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REVISED TO FEB. 16, 1917

SUPPLEMENT TO
AMERICAN FERN JOURNAL
VOL. 7, NO. 1

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Revised to Feb. 16, 1917

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To the Members:

Probably each of you knows at least two people who are interested in ferns, but are not yet members of the Society. Will you not tell them about the Society, and cut out and ask them to use the application blanks printed below? Applications may be sent to any officer of the Society.

You may present my name for membership in the American Fern Society. I enclose one dollar.

Name.....
(In full with all degrees and titles)

Ordinary Signature.....

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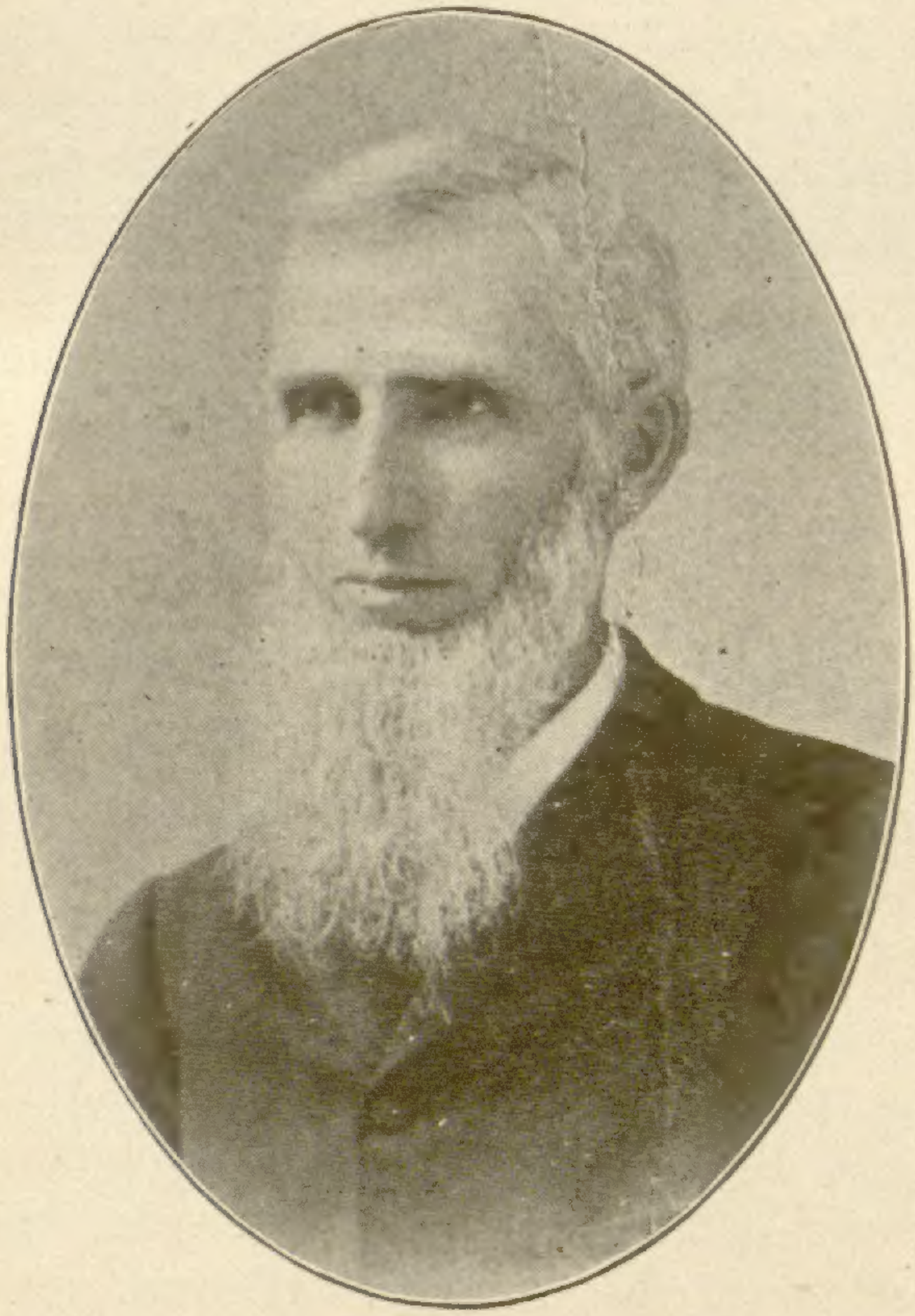

Rev. James A. Bates

In the death of Rev. James Atwood Bates the American Fern Society has lost an ex-president and a charter member whose botanical experience goes back a long generation before the beginning of popular fern study in America. It is almost startling to realize that he began collecting plants in the days of Thoreau, while D. C. Eaton was a school boy, about the time of the

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[No. 4 of the JOURNAL (6: pages 97–136, Plate 6) was issued Dec. 13, 1916.]

birth of L. M. Underwood, and nearly twenty years before G. E. Davenport began the study of ferns.

He was born on May 2, 1832, in the old Congregationalist parsonage in Newton Center, Mass., where his father, Rev. James Bates, was pastor for twelve years. His mother, Emily Atwood Bates, was a sister of Harriet Newell, one of the first missionaries of the American Board to India. He prepared for college at Williston Seminary, Easthampton, Mass., graduating from Amherst College in 1856, and from Andover Theological Seminary in 1860. On October 25, 1860, he married Sarah Adams Tobey and shortly thereafter sailed for Ceylon, where he remained three years as a missionary.

Compelled by ill health to give up missionary work, he returned to America and during the succeeding forty years held pastorates in Huntington, Mass., 1866; Belpre, Ohio, 1867; Brooklyn, Ohio, 1872; Lowell, Mass., 1874; Wolcott, Vt., 1877; Barton Landing (now Orleans), Vt., 1880; Williston, Vt., 1883; Randolph, Vt., 1890; South Royalston, Mass., 1898.

He was President of the American Fern Society during the year 1910. He was a charter member of the Vermont Botanical Club and as long as health permitted was a frequent and interested participant in the meetings of that society. He was not a voluminous writer, but his occasional contributions to the *Fern Bulletin*, FERN JOURNAL, *Bulletin of the Vermont Botanical Club* and other publications all reflect his characteristic mental keenness, youthful enthusiasm, and generous and kindly spirit.

For more than sixty years he employed the spare moments of a busy life in the study of nature, collecting not only plants but minerals, shells and curios from all parts of the world. Among the writer's most vivid recollections of boyhood days is that of sitting in a little Vermont church listening with rapt attention to his

stories of life in Ceylon which he illustrated with images. implements and natural objects collected during his stay in "heathen lands."

His death occurred on the third day of September after several months of failing health, in South Royalston, which had been his home for the past eighteen years. The photograph here reproduced was taken some twenty years ago.

E. J. Winslow.

Is Pellaea glabella Mett. a Distinct Species?[1]

FERMEN L. PICKETT

In an earlier number of the Journal (4: 97–100, Jy-S, 1914) the writer called attention to two forms of the Cliff Brake found growing together on the limestone cliffs of southern Indiana, both of which are locally called *Pellaea atropurpurea* (L.) Link, but which differ so widely that they seem certainly to be distinct varieties or even distinct species.

Through the kindness of Mr. C. A. Weatherby, specimens of both forms were on display at the Philadelphia meeting. Later the broad-leaf specimens were compared with authentic specimens of *P. atropurpurea* var. *Bushii* (collected at Monteer, Mo., by B. F. Bush, Oct. 24, 1901) and reported as identical with that variety. Mr. Weatherby stated that Mr. Bush evidently thought the variety *Bushii* the same as *P. glabella* in as much as his later labels bear the latter name.

In December, 1915, the writer received from Mr. F. C. Greene specimens of *P. glabella* collected Oct. 3, 1915. North Terrace, Kansas City, Mo., which are in every way identical with the Indiana specimens. Later examination of specimens in the Washington State College Herbarium has shown specimens of *P. glabella*

[1] Contribution from the Bot. Dept., Washington State College.

collected in Wisconsin, by E. P. Sheldon at Osceola and by C. A. Davis at Argyle; and specimens of both forms collected near Peru, Nebraska, by R. Kent Beattie. In all these specimens the differences noted in the writer's earlier article are quite evident; but the sheets all bear the name of *P. atropurpurea*.

When the earlier report was made, culture experiments were in progress to determine whether or not specific differences would appear in the gametophyte generations of the two forms. Shortly afterward the writer came to the State College, leaving most of the older culture material at Indiana University. At the present time it seems that there will not soon be opportunity to carry on the culture work to any considerable extent, and so, it may be advisable to report the findings to date.

The prothallia of both forms are very irregular in form, and no clear distinction has been made on that basis. The cells of the prothallia of *P. glabella* are slightly the larger, enough larger so that the plants could usually be distinguished readily when examined microscopically. As reported by W. N. Steil (Bot. Gaz. **52**: 400–401, 1911) *P. atropurpurea* is very largely or entirely apogamous. The same condition holds in the case of *P. glabella* as found by the writer. A full account of the conditions in this form will appear at an early date.

The cultures left at Indiana University have been cared for by Dr. D. M. Mottier, through whose kindness I am able to report that the apogamous sporophytes of *P. glabella are strictly true to type*. The difference is quite noticeable at early stages and there is not a gradation into the *P. atropurpurea* characteristics. This gives rise to an interesting question. In the case of these two apogamous ferns, showing well marked differences of specific rank, is there any likelihood of intergradation or any possible question as to the distinctness

of species? Certainly the two forms cannot be considered the same and the names synonymous as given in the last edition of the Illustrated Flora (I: p. 33.) The writer has found normal variation in both *P. atropurpurea* and *P. glabella*, but has not as yet found the complete breaking down of one or more of the points of difference such as would be expected in intermediate forms. On the other hand, the two forms are found growing side by side, under exactly similar conditions, yet distinct and easily recognized. These facts, together with their character of apogamy and consequent impossibility of interbreeding, certainly give to the two forms the value of distinct varieties; and in the writer's mind, the differences are sufficient to class the forms as distinct species, *Pellaea atropurpurea* (L.) Link and *Pellaea glabella* Mettenius.

To the former notes should be added for the sake of distribution records that *P. glabella* is the more common form found on the limestone cliffs of Monroe County, Indiana.

Through the kindness of Mr. Weatherby the writer has been able to secure the original description of *P. glabella*, and it is given here for the benefit of others who may not have access to the files of *Linnaea*.

Rhizoma abbreviatum paleis membranaceis, rufescentibus, anguste taeniaeformibus, linearibus, acuminatis densissime vestitum; folia chartacea, infra pallide viridia, glaberrima; petiolus 1–3″ longus cum rhachi rufo-fuscus, nitidus, teres, glaberrimus; lamina 2-5″ longa, elongato-oblonga, pinnata s. basi bipinnata; pinnae suboppositae, patentissimae, elongato-oblongae, obtusae, inferiores distantes bi-tripartitae s. pinnulatae; pinnulae 1–2 jugae, sessiles, oblongae, terminales elongatae; nervi immersi, rarius manifesti; sori margine revoluto anguste velati.

America borealis Kimmswick prope St. Louis, Visconsin, Columbia anglica (Lyall), Rocky Mountains.

Adhuc cum *P. atropurpurea* confusa, a quo petiolo rhachique glaberrimis, paleisque latioribus, longioribus brevius subulatis distinguitur. (Linnaea **36**: 87. 1869).

Pullman, Wash.

Onoclea Sensibilis, forma obtusilobata

H. C. RIDLON

Regarding the so-called variety or form *obtusilobata* of the sensitive fern, there seems to be quite a difference of opinion as to the cause of this form, and thus I venture to give my own experience.

Seven years ago I found my first *obtusilobata* form growing among perfectly formed fertile and sterile fronds of the same fern, all growing close to a roadside thicket which afforded partial shade, and in a location which throughout the year was moist.

For five consecutive years I was able to find this form, then, after a lapse of two years during which the station was not visited, I again found the form. As this roadside was undisturbed by scythe or grazing cattle, I am unable to account for this re-appearance each year.

I have tried, without success, to produce this form by removing all normal fronds, also by growing in dry, sterile soil.

SPRINGFIELD, VT.

Mr. Ridlon presents a fresh bit of evidence on a still unsettled question—the cause of the "*obtusilobata*" forms of the sensitive and other dimorphic ferns. His evidence is of the more value because he is not only a careful observer, but an expert in growing plants; and his attempt to produce these forms by means of partial starvation arising from other causes than mutilation of the plant is, so far as the present commentator is aware, an original experiment.

A resumé of the evidence in regard to the cause of *obtusilobata* forms may be of interest here. In 1881 Prof. Underwood suggested that they were modified fertile fronds, and resulted from destruction of the sterile

fronds by mowing or otherwise.[1] In 1894, Prof. G. F Atkinson, testing Underwood's theory, succeeding in producing them artifically by repeated cutting of the sterile fronds on certain plants. He concluded that Underwood was correct and that the variation was caused by semi-starvation, due to injury, which, so to say, compelled the plant to use its fertile fronds for leaf-functions as well as spore-bearing.[2] In 1881,[3] however, and again in 1898, in a paper read at the Boston meeting of the Fern Society, Mr. Davenport presented a considerable mass of evidence to show, on the one hand, that though experiments like Prof. Atkinson's might result in *obtusilobata* forms, they failed to do so more often than not; and, on the other, that plants growing under entirely normal conditions and with their full supply of sterile fronds frequently produced such forms and that the same plant, under apparently unchanged conditions, might have them one year and not the next. He argued that, though injury might produce them, it did so by stimulating a latent tendency which already existed in the plant and which might equally be developed by other, less obvious stimuli; and suggested that the tendency in question might be one toward evolutionary reversion to an earlier, non-dimorphic form. Evidence in support of his conclusion has been brought forward by Mrs. E. G. Britton, Rev. J. A. Bates (at the Boston meeting), Mrs. A. E. Scoullar,[4] W. A. Poyser[5] and now by Mr. Ridlon; and though some have tried, no one seems to have repeated Prof. Atkinson's experiment successfully.

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[1] Bull. Torr. Bot. Club 8: 101.
[2] See Fern Bull. 4: 33. 1896.
[3] Bull. Torr. Bot. Club 8: 109.
[4] Fern Bull. 17: 19. 1909.
[5] Fern Bull. 17: 76. 1909.

ONOCLEA SENSIBILIS, FORMA OBTUSILOBATA

Figs. 1 and 2 from specimens in herb. L. P. Breckenridge; figs. 3–6 from specimens in herb. H. C. Ridlon; fig. 7, one pinna from specimen collected by A. A. Eaton, now in the Gray Herbarium.

It may be added that, in the opinion of the writer, such variations are teratological in their nature. As such, they may be of great significance in the study of the nature and development of plant organs, but have little meaning for purposes of classification and should not be given separate names.

The accompanying illustration, kindly made for the Journal by Miss Una L. Foster, shows a very full series of gradations between normal fertile and sterile fronds.

C. A. W.

Several weeks ago I received from Miss Sarah F. Sanborn, of Concord, N. H., a number of fertile fronds of the Ostrich Fern which were partially developed as foliage fronds after the manner of the *obtusilobata* form of the Sensitive Fern. In regard to these, Miss Sanborn writes: "My Ostrich Ferns have grown for years on the east side of my house, but I never before saw such abnormal growths. I am inclined to think that the great quantity of wood ashes I used about the ferns had the effect noticed."

Here seems to be another bit of evidence in line with the above discussion. Have any of our readers further evidence bearing on the matter? If so, they are invited to send it in to the editors.

E. J. W.

A Christensen Bibliography

Some time ago a list of the botanical writings of Mr. Carl Christensen was published in the Journal.[1] He has now sent us the following list, complete up to the end of 1914. It has already been printed, partly in his own work on Danish botanical literature, partly in the

[1] 2: 56. 1912.

Botanisk Tidsskrift.[2] We print it again, for our readers, as a record of value, and have added the two titles of 1916.

Copies of the items marked with an asterisk have been generously presented to the American Fern Society by Mr. Christensen, and are now deposited with the secretary.

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*Revideret Liste over danske Pteridofyter. –Bot. Tids. **24**: 369–376. 1902.

*New ferns from Brazil. –Bot. Tids. **25**: 77–81. 1902.

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*On the American species of Leptochilus Sect. Bolbitis.—Bot. Tids. **26**: 283–287, 8 f. 1904.

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Index Filicum, sive Enumeratio omnium generum specierumque Filicum et Hydropteridum ab anno 1753 ad finem anni 1905 descriptorum, adjectis synonymis principalibus, area geographica, etc.—Hafniae, 8°. (LX + 744). 1905–6.

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Filices i Aug. Chevalier: Novitates Florae Africanae.—Bull. Soc. bot. France, mémoire **8**: 29–30, 1 f. 1907.

*Revision of the American species of Dryopteris of the group of D. opposita.—Vid. Selsk. Skr. VII. **4**: 247–336, 52 f. 1907.

Botansk for Realklassen.—Kbhvn. 8°. (96, 75 f.). 1909.

*Dryopteris nova brasiliensis.—Fedde: Repertorium sp. nov. **6**: 380–381. 1909.

The American ferns of the group of Dryopteris opposita contained in the U. S. National Museum. —Smithsonian Misc. Collections (Quarterly issue) **52**: 365–396. 1909.

*On Stigmatopteris, a new genus of ferns, with a review of its species.—Bot. Tids. **29**: 291–304, 15 f. 1909.

[2] **34**: 162. 1916.

*Ueber einige Farne in O. Swartz' Herbarium.—Arkiv för Bot. 9[11]: 1–46, 13 f., t. 1–5. 1910.

*On some species of ferns collected by Dr. Carl Skottsberg in temperate South America.—Arkiv för Bot. **10**[2]: 1–32, 4 f., 1 t. 1910.

*Four new ferns.—Fedde: Repertorium sp. nov. **9**: 370–372. 1911.

Pteridophyta in insula Quelpaert a cl. P. Taquet anno 1910 lecta. —Bull. Géogr. Bot. Mans **1911**: 69–72. 1911.

On the genus Dryopteris.—Amer. Fern Journ. **1**: 33–37. 1911.

The Pteridophyta of arctic regions.—Amer. Fern Journ. **1**: 65–70. 1911.

The tropical American species of Dryopteris subgenus Eudryopteris.—Amer. Fern Journ. **1**: 93–97. 1911.

*Two new bipinnatifid species of Alsophila.—Fedde: Repertorium sp. nov. **10**: 213–214. 1911.

*On a natural classification of the species of Dryopteris.—Biolog. Arbejder tilegn. Eug. Warming: 73–85. 1911.

Pteridophyta (excl. Selaginella) in *H. Ross:* Contributions â la flore du Mexique.—Soc. Sci. "Antonio Alzate." Mémoires **32**: 175–199, 1 t. Mexico. 1912.

*On the ferns of the Seychelles and the Aldabra Group.—Trans. Linn. Soc. London II. Bot. 7: 409–425, pl. 45. 1912.

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*Filices Esquirolianae 1910-1911.—Bull. Acad. int. Géogr. Bot. Mans **22** Année: 137–143. 1913.

*A monograph of the genus Dryopteris. Part I. The tropical American pinnatifid-bipinnatifid species. Vid. Selsk. Skr. VII. **10**: 53–282, 46 f. 1913.

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*New ferns from Madagascar.—Arkiv för Bot. **14**[19]: 1–8, 2 t. 1916.

*Maxonia, a new genus of tropical ferns.—Smithsonian Misc. Collections, **66**[3]: 1–4. 1916.

The Ferns of the Lake George Flora, N. Y.

III

STEWART H. BURNHAM

Dryopteris Goldiana x intermedia Dowell

This plant was found in a little swamp near the lower falls of North Beaver creek, Vaughns, Oct. 16, 1892. It was observed for several seasons: and July 14, 1906, was transplanted to the wild garden, as the swamp was being cleared up and pastured. It died a few years after being transplanted. Specimens were sent to Dr. Davenport and Dr. Peck. Although this plant was known under different names, it was finally determined as a hybrid by Dr. Benedict, Jan. 4, 1908.

Dryopteris Phegopteris (L.) C. Chr.

Moist woods and rocky hillsides; infrequent. July–Sept.

Lake George (Mrs. E. Watrous) (Mrs. Russell) (Kemp) (Jelliffe); Easton (Taylor); Stillwater (in an old collection at N. Y. State Herbarium); Clemons to the top of Black Mt.; South Bay; southern W. Fort Ann; Dolph pond, Fort Ann mountains; Fort Ann: Vaughns.

Dryopteris hexagonoptera (Mx.) C. Chr.

Moist woods; infrequent. Aug.–Sept.

Lake George (Mrs. E. Watrous) (Jelliffe); Saratoga Co. (M. O. Wendell in Burt herbarium), 1880; Stillwater (in an old collection at N. Y. State Herbarium); Cambridge (Mr. & Mrs. Cornell); southern W. Fort Ann; Fort Ann mountains; Vaughns; Fenimore; east of Schuylerville; southwest Easton; south of Shushan.

Resembles the preceding species, but the lowest pair of pinnae are not conspicuously reflexed: it grows in drier situations, often in clayey soil.

DRYOPTERIS DRYOPTERIS (L.) Christ

Moist woods and swamps; frequent. July–Sept.

A species with small bracken-like fronds; preferring the shade of beech, maple and hemlock, and often growing in clayey soil.

ANCHISTEA VIRGINICA (L.) Presl

Peat and sphagnum bogs; scarce. July–Sept.

Lake George (Hall); E. Lake George; Glen Lake & vicinity; Podunk Pond marsh; bog on rocks, Curtiss hill, east of Fort Ann. Perhaps exterminated at the last station as a deep-seated fire swept over this hill in 1914.

A handsome fern, formerly known as *Woodwardia*. It is similar to sterile fronds of *Osmunda cinnamomea:* but distinguished by its solitary fronds which arise from the long creeping rootstocks.

CAMPTOSORUS RHIZOPHYLLUS (L.) Link

Dry calcareous rocks and cliffs; not rare in certain sections. Aug.–Sept.

E. Lake George (Dr. M. W. Vandenburg) (Miss E. J. Owen); Silver Bay (Kemp); limestone ridge north of Glens Falls, rare (Hulst); Granville (Pember); Shushan, rare (Dobbin); Cambridge (Mr. & Mrs. Cornell); Crescent.

This fern increases, in abundance as one goes eastward, from the line between Warren and Washington counties; but is not frequently met with on the mountains. At Vaughns, Fort Ann and northwest Hartford, it may be found on nearly every cliff. The basal auricles of the frond are more or less developed: plants with incised fronds are found on dry boulders. This fern is an evergreen: and is usually propagated by the rooting of the tip of the tapering frond.

ASPLENIUM EBENOIDES R. R. Scott

A very fine plant was found July 1905 by Hattie T. Burnham back of schoolhouse No. 8, northwest Hartford, on limestone, in company with *Asplenium platyneuron* and *Camptosorus*. This plant was transplanted to a flower pot and the following year, divided. The portion which Miss Burnham kept lived for several years. The other portion, for several years, grew luxuriantly as a house plant. Late in 1908, I make note, that the general appearance of the plant is more like *Asplenium*, except the tapering rooting fronds which are like *Camptosorus*. At that time 10 of the 11 fronds of the original plant were fruiting finely. Seven of the fronds were over 12 inches long: and 3 or 4 fronds. 20 inches long and 4½ inches wide. The tip of 5 of the fronds forked, the forks being linear and from 2-4 inches long, making the extreme length of the frond. 2 feet. In several instances pinnae formed proliferous plants, which rooted when they became attached to the soil and produced fronds, which also fruited. Unfortunately this plant died during the summer of 1914

ASPLENIUM PLATYNEURON (L.) Oakes

Rocky woods and cliffs; frequent. July-Sept.

This fern is usually met with in partial shade, growing among loose rocks. The sterile and fertile fronds usually become prostrate late in the fall and are almost evergreen.

A form, the var. *incisum* (Howe) Robinson, is found on the limestone rocks one-third of a mile east of schoolhouse No. 8, northwest Hartford. N. Y. State Mus. Bull. **105:** 30-31. 1906. This variety is described as having the pinnae "about one inch long, and all except the extreme upper and lower ones deeply incised-pinnatifid; the pinnules are rather strongly 3-5 crenate toothed." N. Y. State Cab. Rep't **22:** 104. 1869.

ASPLENIUM TRICHOMANES L.

Shaded limestone, but sometimes on sandstone or granite; frequent.

Often associated with the last species. The fronds are evergreen, varying in size and crenation of the pinnae.

ASPLENIUM PYCNOCARPON Spreng.

Moist rich woods; rare. Aug.–Sept.

Blue Mt., Hamilton Co., 3700 feet (Miss E. G. Knight). Bull. Torr. Bot. Club **20:** 459. Dec. 1893; Mt. Hope, Putnam mountains; Ray farm woods, Welch Hollow; Caldwells and Devines woods near Kingsbury.

This fern was formerly known as *A. angustifolium:* and is readily recognized by its once pinnate fronds.

ASPLENIUM RUTA-MURARIA L.

Limestone cliffs; very rare.

A few plants in a little pocket of a cliff, about one mile northwest of schoolhouse No. 8, northwest Hartford, Aug. 3, 1899; July 27, 1900, and Aug. 23, 1901; Skenes Mt., Whitehall, a few plants, Aug. 30, 1900.

HUDSON FALLS, N. Y.

(to be concluded)

Notes and News

Maxonia, a new genus of ferns. Carl Christensen, Smithson. Misc. Coll. **66:** no. 9. pp. 1–4. 30 Sept. 1916.

The new genus, *Maxonia*, is based on a single species, *Polystichum apiifolium* (Sw.) C. Chr. Ind. Fil. which is indicated as intermediate between *Dryopteris* and *Polybotrya*. From *Dryopteris* it differs in having dimorphic leaves, a creeping rhizome, a different type

of pubescence, and peculiarly developing indusium. From *Polybotrya*, it differs in having the sporangia confined to the backs of veins, in possessing an indusium and in being less dimorphic than true *Polybotrya*.

The single species included is found in its typical state in Jamaica and Cuba. From Guatemala material has been collected which is recognized as a variety.

R. C. B.

"THE TREE FERNS OF HAWAII." Under this title, Vaughan MacCaughey has an interesting account[1] of the three species of tree ferns native in the Hawaiian Islands, with some discussion of tree ferns in general. The three kinds all belong to the genus, *Cibotium*, which also furnishes in the form of a Central American species, *C. Schiedei*, the most common tree fern in cultivation.

The article gives special account of the economic value of the Hawaiian tree ferns. The trunks of the larger kinds are used to build corduroy roads through swampy places, a fact already noted by Maxon in his article on American tree ferns.[2] Rude fences are sometimes made by piling sections of trunks together. Florists use them, as elsewhere, as the matrix upon which to grow various epiphytic plants such as orchids. Here in the United States where tree fern trunks are not available, the orchid grower makes use of the black root masses of the Osmundas.

The rootstock and petiole scales of the Hawaiian tree ferns are very abundant, and under the name of *pulu*, have a considerable sale as mattress and pillow stuffing. At one time this sale was much greater than at present. Its sale in the United States was accelerated by special agents who would inquire on registering at a hotel

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[1] Am. Bot. 22: 1–9. June, 1916.

[2] Smithson. Rep. 1911: 463–491. *pl. 1–15*.

whether there were pulu mattresses available. On receiving a negative reply the prospective guest would pass on, leaving the proprietor to consider the advisability of installing a few. Experience showed, however, that pulu mattresses were not long lived and the export soon fell off.

Perhaps the most interesting single fact about these ferns has to do with their use as food. The center of the trunks is starchy and in times of famine has served as human food. Nowadays they cook the trunks in the volcanoes and serve them to the pigs.

R. C. B.

LORQUINIA. *Lorquinia* is a new publication, started in 1916 by the Lorquin Natural History Club of which our member, Mr. Moxley, is one of the interested and active members. Originally organized as a boys' natural history club, the Club has since come to include older members, but it has retained the original broad interests of the earlier organization. Its scope may be judged by the following titles, taken at random: Desert reptiles; A rare cat-tail; Egg-cases of some local mollusca; The study of variation; Palaeontology—its place in the study of natural history; The genus Quercus in California. Among the author's names are the following: E. E. Hadley, E. P. Chace, R. R. Gates, R. A. May, F. Grinnell, Jr., and Cecil Hart.

Altogether, the publication seems to be very well worth while, and is particularly to be recommended to those interested in general natural history, both adults and younger people.

Lorquinia is sent free to members. For further information, address Rev. Geo. L. Moxley, 444 South Spring Street, Los Angeles, or the editor of *Lorquinia*, Mr. Paul D. R. Rüthling, 1051 W. 23rd Street, Los

Angeles, Cal. So far, five eight page numbers have been issued.

A NEW VERMONT STATION FOR ASPLENIUM EBENOIDES. We, my wife and I, began fern hunting last Summer (1915). We spent the month of July at No. Ferrisburg, Vt.—Mt. Philo Inn. This summer (1916) we decided to stay there during July and August because we agreed with Mr. H. G. Rugg that "Vermont is the Fern Lovers' Paradise."

Two miles east of Mt. Philo, in the southeastern corner of Charlotte is Scott's Mill, and just above this mill runs a wooded range of hills. On the western slope of this range, Mrs. Breckenridge had the good fortune to find, on July 29, two fine plants of *Asplenium ebenoides*.

We picked four fronds, one that had evidently survived the Winter. They were from 5 to 7 inches long and each one gave unmistakable evidence of its parentage.

Near by, growing in profusion, was *Camptosorus rhizophyllus* also at least twenty-five specimens of *Asplenium platyneuron*. These plants we had discovered last summer, and we went to the station determined to find our Scott's Spleenwort. I wonder if the name of that mill helped any.

L. P. BRECKENRIDGE.

Mr. A. W. Brown sends in some additions to Dr. Benedict's list of Adirondack ferns, recently published in the JOURNAL. "I was there" he writes "in August of this year and last and, like Dr. Benedict, found so many attractions that I did not look very closely for specimens, but can add to the list *Struthiopteris germanica*, *Botrychium obliquum* and *Dryopteris marginalis* (on Bald Mountain). The region does not seem specially rich

in ferns, but in a very uncanny looking swamp with immense boulders between Old Forge and Bald Mountain I found by far the finest plants of *Polypodium vulgare* and *Dryopteris Dryopteris* I ever saw, and I have found lots of them in England, Scotland, Wales, France, Canada and the United States."

AMERICAN FERN SOCIETY

The Brooklyn Meeting

A meeting of the Society was held, as announced, at the Brooklyn Botanic Garden on the afternoon and evening of December 29th, in connection with the American Association for the Advancement of Science. Thirty-one persons, members and their friends, registered as present. The authorities of the Garden received us hospitably and provided for us a convenient lecture-room with plenty of wall and table space for exhibits.

The afternoon was spent in visiting, under guidance of Dr. Benedict, the many points of interest at the Garden. First came the conservatories, where winter instruction in horticulture for public school children was going on. The conservatories contain a considerable number of economic plants and in them Dr. Benedict has gathered what is undoubtedly the largest collection in the world of the different forms of the Boston fern. These show an astonishing range of variation, with fronds plane or ruffled, one- to five-pinnate and three or four inches to six feet in length. Next was a cold, but interesting walk about the out-door portion of the Garden. We visited the Japanese garden, planned and constructed by Japanese experts; the rockery; the local flora garden in which it is planned to have growing representatives of all species found wild within 100 miles of New York City; and last, but far

from least, the site of the Society's fern garden. It occupies a shaded hillside, on which large stones and logs have been arranged to reproduce, as far as possible, natural woodland conditions. Next season there is to be an artificial brook, and then there will be no excuse for our ferns if they fail to make themselves at home.

At six o'clock the party proceeded to New York, where we were joined by a delegation from the Sullivant Moss Society meeting and dined exotically at a Chinese restaurant on such mysterious dainties as Chow Mein and Gem Get. One or two timid ones were inclined to partake of this nourishment only telepathetically and ocularly (the Secretary is not responsible for these words); but the rest of us found them very agreeable. Nothing venture, nothing have.

At the evening session, also at the Garden, the walls and even the windows of our room were well covered with exhibits of specimens. The Curator showed one of Mr. Bigelow's sets of *Dryopteris* hybrids and the Philippine Lygodiums from the Society herbarium. Mr. Ware exhibited more than 80 miscellaneous specimens from Europe and America. An interesting feature of his exhibit were some very tall plants mounted on folding sheets which, when opened out, showed the specimens at full length without bending. Mr. Killip brought in 50 or more Jamaican ferns notable for their beauty of form. Mr. Carhart, in addition to a set of specimens illustrating his talk, showed a sheet of the *Dryopteris Clintoniana-cristata* cross mentioned in his recent paper on New Jersey ferns in the JOURNAL, and a few other interesting specimens. Mr. Brandegee exhibited a very fine set of 54 copyrighted photographs of New England ferns, which he has recently brought out and is offering for sale.

Our President-elect, Mr. Palmer, showed a series of specimens illustrating tendencies and range of variation

in *Botrychium virginianum*, *Lycopodium adpressum*, *Onoclea sensibilis*, *Osmunda regalis*, *Polypodium occidentale*, *P. vulgare*, and *Polystichum acrostichoides* (particularly a perfectly bipinnate frond of the last, growing from the same rootstock with nearly normal fronds), pointed out the external causes which he believes have produced some of the variations and explained others as probable reversions to an earlier type. Mr. Winslow described the localities at which the male fern has been found in Vermont and gave a history of their discovery. The first four of them were found by women—a circumstance which no less a person than a President of the Fern Society has suggested may be explained by the fact that the *male* fern was the one concerned. Mr. Carhart told of finding, growing together in an old excavation, typical *Lycopodium inundatum* and three related plants—*L. inundatum*, var *Bigelovii*, *L. adpressum* and *L. alopecuroides*, which were there readily distinguishable, and pointed out some of the characters which separate them. Mr. Killip told something of the localities from which his ferns came. We expect to hear further from all of these papers in the JOURNAL.

The meeting closed at a late hour with a vote of thanks to Dr. Benedict and the authorities of the Brooklyn Botanic Garden for the much that they had done to make it a success.

C. A. WEATHERBY, *Secretary*.

ANNUAL REPORTS OF THE SOCIETY

Report of the President for 1916

The officers' reports following this will give details of the work of the year in the different departments. I will refer to them briefly in a general way and then speak of a few matters to which I think attention should be called. The financial condition of the Society has

improved. At the close of the year all bills had been paid, a sum set aside to meet the expense of printing a list of the specimens in the herbarium and a balance carried over to help meet the expenses of the coming year, which promise to be heavier than usual. In addition there is now a permanent fund of $100.00. In making up the budget two years ago I advised that all current expenses should be met from regular receipts and that the income from sale of back numbers of the JOURNAL (always an uncertain amount), be set aside as a reserve fund, to be expended only in case of emergency, and if not thus expended, at the close of the year, to be placed in the Permanent Fund for which our constitution now provides. This plan has been followed and as a result the Permanent Fund has increased to $100.00. The amount is small of course, but it is a beginning and I hope this same plan will be followed in the future, and if so, these receipts from sales of JOURNALS combined with the fees of the new members whom we believe will come in occasionally as life members, will ere long give the Society a permanent fund that will help toward financial stability and be of appreciable service in carrying out and adding to its various activities. The JOURNAL has been during the year in the hands of the same able editors who have conducted it in the past. They are all giving much time and service to the Society, for which it is under great obligations; it is to be hoped the Society may long be able to retain their services in this capacity. The herbarium, under the fostering care of the curator, shows an increasing number of specimens each year. It is expected to have a list of specimens printed in the near future. The Society has occasionally an opportunity to acquire books or pamphlets that might be the nucleus of a library, but having a library implies some permanent and secure place in which it can be kept. If the plan for a library

is ever carried out and the herbarium continues to grow, it will mean that the time will come when arrangements will have to be made with some large institution willing to provide fireproof room and cases and where herbarium and library can be kept together and cared for. This may seem far in the future, but it is something the Society should have in mind. The report of the secretary shows that the Society is in possession of better files of its own publications than ever before and that the affairs of his office are in the best of condition. The Society is much indebted to Mr. Bigelow and those who have assisted him in securing the material for, determining and sending out to applicant members the sets of hybrid ferns. They should be of much assistance in the study of these often perplexing forms. I feel that the members should make a larger use than they apparently do of the facilities the Society affords for the exchange or gift of specimens. The membership of the Society is slowly and steadily increasing. The loss of some members each year is inevitable. New members must be secured to more than fill the places of those lost if our number is to increase. Membership in the Society appeals only to those who have an interest in our specialty; for this reason new members must come almost entirely through the help of those now in the Society and the increase we have is good evidence that we are getting such help. May we not have the same help the coming year only more of it? A little work from each one will show large results when brought together on the books of the treasurer.

After three years service as your president it is my good fortune to be able to retire leaving the editorship of the JOURNAL and the offices of Secretary and Treasurer in the hands of the men who have ably cared for them in the past and who are working in harmony for the good of the Society. The members may thus expect

increased growth and prosperity under the guidance of your new president and I feel sure he will receive the same cordial support that has been accorded me during my term of office.

C. H. BISSELL, *President.*

Report of the Secretary for 1916

The Society has had a reasonably prosperous year, and one with its fair share of interesting events. Through the kindness of Dr. Grout, a field meeting (not so well attended as it should have been) was held in July at his cabin in Newfane, Vt.; and a winter meeting took place at the Brooklyn Botanic Garden on December 29th. Both have been, or will be, reported elsewhere.

With the coöperation of a few others, notably Dr. Dowell, who made the critical determinations, Mr. Bigelow prepared and issued to members sets of the northeastern species of *Dryopteris* and their hybrids. Thirty-seven sets of from 15 to 17 sheets each were sent out; and they contained material of all but one of the possible hybrids of our six common species of the *spinulosa* group. So far as the Secretary is aware, this is the first time that so nearly complete a series of these puzzling plants, authentically determined, has been made available.

Besides these sets, three species, *Scolopendrium vulgare*, *Schizaea pusilla*, and *Lygodium palmatum*, have been offered to members. Those who are able to get specimens of the rarer ferns in sufficient quantity should continue these offerings.

Some years ago Prof. Hopkins, then Secretary, pointed out the possible usefulness of a Society library. Until the Society has permanent headquarters and much more money than at present, it cannot maintain a library of any size; but it can keep as complete a file as possible of its own official organs and publications at the disposal

of members. With this end in view, a set of Volumes 7–20, inclusive, of the *Fern Bulletin* has been acquired by an exchange with Prof. Clute and is now ready to lend. Three members have already availed themselves of it, and it is hoped that many more may do so in future. Mr. Christensen's generous gift of 18 reprints and originals of his works is an even more notable addition to the Society's literary assets.

At the annual election an amendment to the Constitution, providing a method of election of honorary members and limiting their number, was adopted. Its text is as follows:

Amend Article III by adding:

SECTION 6. Honorary members may be chosen when unanimously nominated by the Council, and their names submitted to the members at the next succeeding annual election. Three-fourths of the vote cast on the question shall be required for election, and the total number cast must be at least twenty. Honorary members shall be entitled to all privileges of the Society without payment of dues. The number of such members **shall not exceed five at any one time.**

During the year two persons have changed from ordinary to life membership, making a total of three life members now on the rolls. Two members, Mr. Laird and Mr. Bates, have died and news of the earlier deaths of two others has reached the Secretary for the first time; eleven have resigned; and five have been dropped for non-payment of dues. Twenty-six new members have been received. The total membership at the date of this report (December 31, 1916), not including the one honorary member, is 261, a gain of six over last year and a new record for the Society. The growth is small, but it seems to be normal and healthy and, best of all, to have been brought about by the coöperation of a number of the present members in securing new ones. That is the only sure way; we must all see to it that growth continues during the coming year.

C. A. WEATHERBY, *Secretary*.

Report of the Treasurer for 1916

Owing to the efficient working of the budget, only two orders from the Council were necessary during the year. One was for the unforeseen expense of binding the Society's duplicate set of the *Fern Bulletin*, the other, at the close of the year, to issue a larger number of the JOURNAL for No. 4, which seemed wise, since sufficient funds were available.

Two special orders were adopted, one to transfer $55.00 from the emergency fund to the permanent fund and to make the balance available for regular expenses, the other to set aside $25.00 to print a catalogue of the herbarium of the Society.

It seems as though more members might remember the special illustrating fund with gifts, making possible more illustrations in the JOURNAL.

TREASURER'S ACCOUNT, JANUARY 1 TO DECEMBER 31, 1916

RECEIPTS

Cash on hand, January 1, 1916		$ 56.34
Membership dues for 1914	$ 3.00	
" " " 1915	23.10	
" " " 1916	225.00	
" " " 1917	19.00	
" " " 1918	3.00	
" " " 1919	1.00	
		274.10
Subscriptions, 1915	$ 1.80	
" 1916	33.88	
" 1917	6.15	
" 1918	0.90	
		42.73
Sale of Back Numbers of JOURNAL		26.46
Gifts for Special Illustrating Fund		4.50
Advertising		4.00
Interest on Emergency Fund		3.00
Incidentals		0.71
		$411.84

DISBURSEMENTS

President's Postage	$ 2.00
Vice-President's Postage	1.00
Secretary's Expenses, Postage, Election and List of Members	19.50
Carried forward	$ 22.50

Brought forward			**$ 22.50**
Treasurer's Expenses			15.00
Curator's Expenses, Herbarium Supplies			8.13
Binding *Bulletin*			3.10
Special Illustrating Fund for JOURNAL			8.10
JOURNAL Expenses:	**Printing**	**$204.48**	
	Postage and Supplies	12.51	
	Illustrating	**13.00**	
			229.99
Total Expenses			**$286.82**
Transferred to Permanent Fund			**55.00**
Grand Total			**$341.82**
Balance, December 31, 1916			**70.02**
			$411.84

This balance consists of special illustrating fund, $5.90; fund set aside for printing catalogue of herbarium, $25.00; regular fund, $39.12. The permanent fund contained $15.00 at the beginning of the year. Receipts: two life memberships, $30.00; transferred from emergency fund, $55.00; present total, $100.00. The interest on this fund was not reported before December 31st. Interest only is available for expenses, if needed. Emergency fund, temporarily wiped out by transfer of $55.00 to permanent, and the balance, $3.21, to regular fund. Special illustrating fund: on hand January 1, 1916, $9.50; received gifts, $4.50; total, $14.00. Paid out for JOURNAL illustrations, $8.10; balance, $5.90.

The Treasurer wishes to say that the work has been very pleasant and he appreciates the coöperation of both officers and members of the Society.

J. G. UNDERWOOD, *Treasurer.*

Report of the Curator for 1916

The Society herbarium is now being kept in cases provided for it at the State Normal College, Kent, Ohio. Members of the Society (or others interested) who may happen to be passing through this section are invited to stop and see it.

The Herbarium now numbers 2426 mounted sheets, 192 sheets having been added since the last report, up to January 1, 1917.

Dr. O. E. Jennings gave 19 sheets; Prof. F. T. Macfarland, 2 sheets; Mr. C. L. Gruber, 4 sheets; Mr. C. H. Bissell, 114 sheets; while 55 sheets were donated by the members who attended the Society field meeting at Syracuse.

Some 200 much needed genus covers were purchased in September and placed in immediate use.

Eight members borrowed material for study during the year and several were helped in making identifications of specimens sent in.

L. S. HOPKINS, *Curator.*

Report of the Editors for 1916

The editors of the FERN JOURNAL are concerned with two things: the material received for publication, both as to its quality and quantity; and the amount of money available for its publication. The following quotation from a recent letter will serve very appropriately as a basis for a discussion of the present status of these editorial problems.

"I did not realize that the FERN JOURNAL was so favored as to have so much material, neither did I wish to bother you by having you tell me so much about it. Nevertheless I am glad to know it. I wonder if we could not get money enough somehow to unload all of the material into one good fat copy of the JOURNAL. I realize the Society is small and doubtless our finances will not let us be very ambitious in the matter of publications."

Regarding the amount of material, we have usually articles for two numbers in advance, that is, for six months ahead. In general, articles are published in the order of receipt, but occasionally there is reason

for holding one longer or publishing it sooner. An article by one of the editors waited in typewritten form over a year before it appeared in a 1916 issue. Some articles, especially illustrated ones, for which the cost of illustration has been privately contributed, may get into the JOURNAL immediately. The mechanical task of "making up" a given supply of copy to fit a thirty-two page issue of the JOURNAL is such as to make it necessary at times to violate the sacred principle of priority. We do not wish, however, to discourage contributions of articles. We cannot have too many good ones, long or short.

Regarding the financial phase of the JOURNAL problems, there are two ways in which we can increase the size of the JOURNAL. First, by increasing the membership and list of subscribers, the Treasurer will come to have a surplus over and above the budget estimate of receipts, and this surplus may be awarded the JOURNAL as was done with the last issue for 1916 when a forty page number was published. Second, the Treasurer is ready to receive extra contributions specifically for the purpose of increasing the size of future numbers. From the same member who was quoted above comes this further suggestion: "If others feel as I do, perhaps we can put in enough to clean up a lot of the back work available for the JOURNAL." How many will be willing to share in the extra expense of issuing a sixty-four page number? It is a question whether the extra pages will mean added value to you. Let the Editors know by a post-card if willing.

As the Treasurer's report shows, contributions for illustrating purposes to the amount of $4.50 were received in 1916, for which the Editors hereby express their thanks.

R. C. BENEDICT,
E. J. WINSLOW,
C. A. WEATHERBY,
Editors.

Report of the Judge of Elections

To the Secretary of the American Fern Society:

The undersigned, Judge of Elections by appointment of President Charles H. Bissell, respectfully presents the following report of the balloting at the annual election held in October, 1916:

Whole number of ballots cast 94

For President

William Palmer	92
C. H. Bissell	**2**

For Vice-President

Mrs Mary A. Noble	92
Rev. John Davis	**2**

For Secretary

Charles A. Weatherby	94

For Treasurer

Jay G. Underwood	**94**

Amendment to Article III of the Constitution	for	91
	against	1
	not voting	2

I therefore declare the election of Mr. William Palmer as President, Mrs. Mary A. Noble as Vice-President, Mr. Charles A. Weatherby as Secretary, and Mr. Jay G. Underwood as Treasurer of the American Fern Society for 1917, and the adoption of the proposed amendment to Article III of the Constitution.

M. A. Marshall.

Still River, Mass., November 7, 1916.

The Journal has received from Mr. C. L. Gruber a most interesting account of his experiences with a fern garden. Many of our other members have tried their hands more or less at growing ferns. If enough will send in, say during the next two months, notes, long or short, about their experiences, the Editors will issue a fern garden number of the Journal.

Mr. Carhart and Mr. Killip are following the excellent example set by Mr. Topping some time ago. The former is to give the Society herbarium a complete set of the New Jersey ferns he has collected, and the latter a set of his Jamaican ferns. What an herbarium we

should have if all the states and all foreign collections by our members could be represented that way!

Our new member, Bro. Marie-Victorin, is engaged in monographing the ferns of Quebec, and desires to correspond and exchange specimens with any one who has collected in Quebec or in regions adjacent to the boundaries of that province. Address: Bro. Marie-Victorin, Longueuil College, Longueuil, P. Q., Canada.

Botanists interested in plant distribution in eastern North America will welcome the promise of a better knowledge of this vast and largely unexplored region. Bro. Victorin has recently published a scholarly report on "The Flora of Temiscouata," one of the eastern counties of Quebec, a 125-page pamphlet illustrated with maps, drawings and photographs.

Mr. Robert A. Ware, 246 Devonshire Street, Boston, offers the following to members for postage: *Pellaea Breweri*, *P. andromedaefolia*, *P. densa*, and *P. ornithopus*, all from California. Mr. Ware also writes that he has a large number of duplicates, chiefly of New England species, which he would be willing to dispose of on the same terms. Any member interested should write to Mr. Ware.

Mr. E. W. Graves, Long Island, Ala., wants specimens of *Ophioglossum vulgatum*, *Botrychium Lunaria*, *B. matricariaefolium*, *B. simplex*, *Pellaea gracilis*, *Woodsia hyperborea*, *W. glabella*, *Aspidium fragrans*, and *Schizaea pusilla*. He offers in exchange *Trichomanes Petersii*, *T. radicans*, *Asplenium Bradleyi*, *A. pinnatifidum*, *A. parvulum*, *A. montanum*, *Adiantum Capillus-Veneris*, *Cheilanthes alabamensis*, *Ch. tomentosa*, *Polypodium polypodioides*, *Pellaea atropurpurea*, *Woodwardia areolata* and ***Aspidium Filix-mas***.

Mr. Irving Holcomb, Granby, Conn., would be pleased to exchange living plants of the ferns of his vicinity for living plants of native species of ferns and orchids not now in his fernery or garden. He finds 46 species and 10 varieties of ferns growing in or very near Granby.

Mr. E. P. Killip, 32 North Goodman Street, Rochester, N. Y. would like to exchange Jamaican ferns for ferns of the southwestern United States.

I have on hand six hundred duplicate sheets including probably fifty or more species of Pteridophytes. These are being made up into sets each set including one or more specimens of all material available at the time it is made up. The sets contain species of Isoetes, Equisetums, some hybrids, and a few foreign species. There will be about fifteen sets in all. I shall be glad to give these sets to the first members who apply for them for the postage. Send sufficient postage; unused stamps will be returned.—*L. S. Hopkins, Kent, Ohio.*

I wish to thank, through the JOURNAL, the men who made it possible to send out the sets of *Dryopteris* species and hybrids issued last fall: Dr. Philip Dowell for material and determining the hybrids; Mr. C. A. Weatherby for material, writing the labels and help in getting the sets ready for mailing; Messrs. C. H. Bissell, E. J. Winslow, Macy Carhart and C. W. Vibert, and Dr. Chas. W. Lee, Jr., for material. I also wish to thank the members who received sets for their appreciative letters to me.

H. C. BIGELOW.

American Fern Journal

Vol. 7 APRIL–JUNE, 1917 No. 2

New Polypodiums From Tropical America

CARL CHRISTENSEN

In the last number of his highly valuable "Studies of Tropical American Ferns"[1] Mr. William R. Maxon has given a revision of the species pertaining to the groups of *Polypodium furfuraceum* and *P. squamatum*, which groups fall under the genus *Lepicystis*, as defined by Diels, or *Polypodium*, Section *Marginaria*, of Index Filicum. Trying to determine my material of the two groups in accordance with Maxon's treatment, I found some specimens in my bundle of species grouped together under Section *Marginaria*, which I noted as probably new species long ago. I take the opportunity now to describe two of them.

Polypodium steirolepis C. Chr., sp. nov.

Polypodium nigripes Hook. Sp. Fil. **5:** 17. 1863 (not Hassk. 1844).

Under *P. leucosticton* Kunze, Mr. Maxon[2] lists a Venezuelan specimen of the collection cited below (*Eggers* 13041). I cannot, of course, know whether the plant in the U. S. National Herbarium really belongs to *P. leucosticton*, but my specimen is clearly different from that species as defined by Hieronymus, although it most probably is a near ally of it and of *P. plebejum*. I have little doubt of the identity of my specimen with *P. nigripes* Hook. Hooker's description fits very well; nevertheless the specimen has not *black* stipes and rachis.

[1] Contr. U. S. Nat. Herb. **17**, Part 7. 1916.

[2] Loc. cit. p. 573.

[No. 1 of the Journal (**7:** 1–32, Plate 1.) was issued March 3, 1917.]

From *P. leucosticton* it differs chiefly by its subphlebioid venation; the fronds are not subdimorphous but rather alike, broadly deltoid or broadly ovate-oblong, the fertile ones on longer stalks, but their lamina not linear-oblong as in *P. leucosticton*. Leaves variable in size and division, lobate, deeply pinnatifid or even pinnate below. Pinnae or segments of larger fronds 8--10 pairs, 5 cm. long, 1 cm. broad, coarsely serrated toward the apex. Texture very thick. Surfaces of young fronds clothed with ovate, lacerato-ciliate, brown scales, those of the under side numerous but not covering the whole surface; surfaces with age naked. Stipe and rachis beneath, when young, chaffy by thin, pale yellow, lacerato-ciliate or dentate, lanceolate scales, the larger of which (especially those of the lower part of the stipe) have a dark brown or black midline. Rhizome about 5 mm. thick, densely clothed by small carinate, lanceolate scales, consisting of a lanceolate-acuminate, black, rigid median part bordered by broad, hyaline, pale yellow, fimbriate margins.

VENEZUELA: Los Tegñes, alt. 3800 ft., *Eggers* no. 13041, 12. 6. 1891.

POLYPODIUM PLEOPELTIDIS Fée, Crypt. Vasc. Brés. **1:** 86. *pl. 26. f. 1.* 1869.

Polypodium typicum Fée, Crypt. Vasc. Brés. **2:** 52. *pl. 96. f. 2.* 1872–73; Maxon, Contr. U. S. Nat. Herb. **17:** 568. 1916.

A comparison of authentic specimens from the type collection, in the Botanical Museum of Copenhagen, of *P. pleopeltidis* Fée (*Glazion* 2459 and 2817) and of *P. typicum* Fée (*Glazion* 5294) has convinced me that the two supposed species are forms of a single species. *P. pleopeltidis* is, as illustrated by Fée, a rather large form rivalling *P. plebejum* in size, with distant and (towards the acute apex) more or less coarsely crenate segments. *P. typicum* is smaller, with more approxi-

mate segments, these having obtuse tips. But other specimens are intermediate between these two extremes, and all forms seen agree closely as to the scales of the rhizome and under side of the lamina.

In general aspect *P. pleopeltidis* resembles more *P. madrense* J. Sm. (*P. oulolepis* Fée) than *P. plebejum*, but the scales are very different. It has a more slender rhizome and the leaves are more distant than in the two Mexican species. Several specimens bear a row of white dots ($CaCO_3$) along the margins above the tips of the veins (hydathodes), a character not observed in the two species mentioned.

Polypodium tobagense C. Chr., sp. nov.

Rhizome long-trailing, threadlike as in *P. piloselloides*, its scales with a long, hairlike, flexible apex. Leaves scattered, isomorphous or nearly so, on stalks scarcely 1 cm. long, entire, lanceolate, narrowed toward both ends (the apex acute), up to 10 cm. long, about 1 cm. broad below the middle, subcoriaceous or membranous, dark-green above, grayish-green beneath. Scales of the surfaces minute, mainly like those of *P. piloselloides*, those of the midrib beneath rather numerous and large, lanceolate, red-brown. Venation and sori as in *P. piloselloides*.

BRITISH WEST INDIES: Tobago, Belmont Road, Adelphi, running on a tree, *W. E. Broadway* no. 3615, January 24, 1910.

Related closely to *Polypodium piloselloides* L., a simple-leaved species belonging to a group not treated in Mr. Maxon's paper. It differs essentially from true *P. piloselloides* by its long, lanceolate fronds, the sessile and fertile ones being scarcely different as to shape and size, while in *P. piloselloides* the leaves are decidedly dimorphous.

Ferns of Jamaica

ELLSWORTH P. KILLIP

The island of Jamaica has long been one of the paradises of the world for the fern collector. Here all the elements essential to a luxuriant fern growth seem to occur in just the right quantities. A constant supply of heat and moisture and an altitude ranging from sea-level to 7428 feet have resulted in the development of a large number of species.

The island is approximately 150 miles from east to west and 50 miles from north to south. A ridge of mountains runs from east to west through the center of the island and it is among these mountains that the greatest number of ferns are found. In my brief visit to Jamaica in the winter of 1916, my fern collecting was chiefly confined to the mountainous regions of Cinchona and Hollymount.

Cinchona is the name given to a vast tract of land, ranging in altitude from 4500 feet to 6100 feet, embracing a portion of the Blue Mountain Range slightly to the northwest of Blue Mountain Peak. An unsuccessful attempt was made by the Jamaican government some years ago to introduce quinine (Cinchona) here. This was one of the tropical stations of the New York Botanical Gardens for some years. At the time of my visit it was unoccupied and the Director of the Public Gardens very kindly placed the several well-built buildings, including a laboratory, at my disposal.

Sir John's Peak, situated in the reservation, is the second highest mountain in the island. The trail leading from the buildings at 4900 feet altitude, to the summit, passes in part through dense, moist forests and in part skirts the sides of mountains through territory exposed to the sun's rays. At times the trail runs along windward slopes where conditions are particularly

favorable to fern growth; at other times it follows the leeward slopes. On the trunks and branches of trees in the moist forests masses of *Polypodia* and *Hymenophylla* hang down, while various species of *Diplazium* and *Asplenium* are found as terrestrial plants. On the leeward slopes and in open situations *Polystichum struthionis*, *Pteridium aquilinum*, *Histiopteris incisa*, *Pityrogramma calomelaena*, as well as various species of *Dicranopteris* and *Lomaria*, occur. Tree-ferns, some of them reaching thirty feet in height, are common.

The three mile road to Morce's Gap in general resembles the more open portions of the trail to Sir John's Peak. Deep ravines, however, frequently occur and these are filled with a varied assortment of ferns. The trail gradually works its way to the windward side of the ridge, where another very fruitful region is found. Tree-ferns are particularly abundant at Morce's Gap.

In making the descent from Cinchona to Papine (about fifteen miles distant and at an altitude of about 1000 feet) the characteristic ferns found were *Pityrogramma sulphurea* and *tartarea*, *Blechnum occidentale*, *Pteris longifolia*, *Anemia hirsuta*, *Notholaena trichomanoides*, *Cheilanthes microphylla*, and *Trismeria trifoliata*. One of the two native species of *Adiantum*, (*A. concinnum*) found in this part of the island, was discovered a few miles east of Papine. These ferns also characterized the flora along the road to Newcastle.

A few days were spent at Hollymount (altitude, 2000 to 3000 feet) in the center of the island. Here the ferns for the most part were representatives of the genera *Dryopteris*, *Polystichum*, *Adiantum*, and *Tectaria*. The roadsides both here and at Moneague and St. Ann's Bay, later visited, were lined with *Anemia adiantifolia* and *Adiantum tenerum*. Occasionally unusual forms of *Polypodium* would be found, twining about trees and trailing over rocks.

Over 500 species of ferns and fern-allies are recorded from Jamaica. Many of these are very local and but seldom collected. In the two weeks the writer spent in fern-hunting 137 species were found. In the list appended the stations given merely represent localities from which specimens were collected and are not to be considered as limiting the range of the species to those stations. Several sets were collected of which one has been presented to the United States National Museum, another to the Rochester Academy of Science, and a third to the American Fern Society. The writer still has on hand several specimens which he will be glad to exchange with members of the Fern Society.

In the *Fern Bulletin* of July, 1900, Mr. Willard N. Clute commenced the publication of a list of fernworts collected in Jamaica. Comparison of his list with mine is somewhat difficult, as recent study has resulted in the formation of new species and in alterations of genera. Eliminating certain genera in which these difficulties are particularly pronounced, together with *Lycopodium* and *Selaginella* of which I find no reference in the *Fern Bulletin*, we find that Clute's list records 193 species while mine has 118. His list contains about 112 species not found in mine, while mine contains about 37 not listed by him. About 80 species are common to both. Among the filmy ferns and in the genus *Asplenium* Mr. Clute's net gain was especially large. In comparing these lists it must be remembered that his investigations covered the eastern portion of the island alone while mine extended over the central portion as well; on the other hand he spent considerably more time in the island.

Forrest Shreve, in a work entitled "A Montane Rain-forest" published by the Carnegie Institute in 1914, gives a very detailed account of Cinchona and includes a list of the Pteridophytes he gathered there. A com-

parison of his list of ferns with mine shows that he collected 90 species as compared with my 82 and that he gathered 43 not found by me, while I gathered 35 not found by him. Species common to both lists number 47.

In conclusion I wish to express my very great thanks to Mr. William Harris, Director of the Public Gardens of Jamaica, for his kindness in permitting me to stay at Cinchona and for the very valuable aid which he rendered me in many ways, and to Mr. W. R. Maxon, of the United States National Museum, for making the determinations of the ferns.

Hymenophyllaceae

TRICHOMANES

1. T. CRISPUM L. A large species. Sir John's Peak, 5800 ft. (228)
2. T. RADICANS Swartz. In dense woods. Pinnae variously cut. Morce's Gap and Hollymount. (283, 432)
3. T. RIGIDUM Swartz. Along trail to Morce's Gap. (303)

HYMENOPHYLLUM

4. H. ASPLENIOIDES Swartz. A delicate filmy fern with fronds but slightly cut. On trees, Sir John's Peak, 5900 ft. (312)
5. H. FUCOIDES Swartz. Not common. Growing on trees along the trail to Sir John's Peak, 5700 ft. (237)
6. H. POLYANTHOS Swartz. A common fern on trees. There is great variation in the outline of the pinnae. (237a, 296, 304, 313)
7. H. SERICEUM Swartz. Common on trees along the Sir John's Peak trail and at Morce's Gap. It has very woolly fronds. (245)

Cyatheaceae

CULCITA

8. C. CONIFOLIA (Hook.) Maxon. Along trail to Sir John's Peak, 5600 ft. (249a)

CYATHEA

9. C. FURFURACEA Baker. Common along the trail to Morce's Gap. (298)
10. C. PUBESCENS Mett. A large tree-fern. Morce's Gap. (287)

ALSOPHILA

11. A. QUADRIPINNATA (Gmel.) C. Chr. Sir John's Peak, 5500 ft. (249)

Polypodiaceae

DRYOPTERIS

12. D. ASPLENIOIDES (Swartz) Kuntze. Cinchona, about 5000 ft. (171)
13. D. ASTEROTHRIX (Fée) C. Chr. Hollymount woods. (439)
14. D. CORDATA (Fée) Urban. A species which, according to Maxon, "is nowhere very common in the West Indies and decidedly uncommon in Jamaica." Hollymount. (469)
15. D. EFFUSA (Swartz) Urban. Fairly common at lower altitudes. Content trail near Gordon Town. Hollymount. (336, 458)
16. D. GUADELUPENSIS (Wikstr.) C. Chr. In crevices of rocks, Port Antonio. (536)
17. D. HETEROCLITA (Desv.) C. Chr. Along the Morce's Gap trail about a mile north of the market-place. Sir John's Peak trail, 5100 ft. (214, 255)
18. D. HIRTA (Swartz) Kuntze. Hollymount woods. (430)

19. D. NORMALIS C. Chr. Along roadside near Papine. Hollymount woods. (98, 449)
20. D. OBLITERATA (Swartz) C. Chr. At Hollymount along the road to Moneague. But one specimen secured. (409)
21. D. OLIGOCARPA (Willd.) Kuntze. In Cinchona woods, 5000 ft. (261)
22. D. PATENS (Swartz) Kuntze. Newcastle, about 2500 ft. (357)
23. D. PATULA (Swartz) Underw. Morce's Gap. Not common. (625)
24. D. REPTANS ((Gmel.) C. Chr. Trail to Morce's Gap; Hollymount-Moneague road. A variable species, one form being found at Ewarton (485a) which is decidedly prostrate and with much shorter pinnae. (306, 485)
25. D. SAGITTATA (Swartz) C. Chr. Hollymount woods. (421)
26. D. SANCTA (L.) Kuntze. Grows in thick clumps in dense woods near Hollymount. (439)
27. D. SERRA (Swartz) Kuntze. Along road to Newcastle, about 2700 ft. (358). A form approaching *D. oligophylla* Maxon (503) was found at Roaring River Falls.
28. D. SERRULATA (Swartz) C. Chr. Along Hollymount-Moneague road. (483)
29. D. TETRAGONA (Swartz) Urban. Frequent at lower altitudes. Along road three miles east of Gordon Town; Roaring River Falls. (320, 501)
30. D. VILLOSA (L.) Kuntze. Morce's Gap. (624)

POLYSTICHUM

31. P. AMBIGUUM Maxon. Of this specimen Maxon says, "This is a puzzling form. probably referable to *Polystichum ambiguum* Maxon. but verging toward *P. Christianae* (Jenman) Maxon." Hollymount. (470)

32. P. CHRISTIANAE (Jenman) Maxon. Hollymount woods. (425)
33. P. DENTICULATUM (Swartz) J. Smith. Frequent along Sir John's Peak trail, 5800 ft. (225)
34. P. STRUTHIONIS Maxon. Common along fairly open trails at Cinchona. Morce's Gap. (203)
35. P. POLYSTICHIFORMIS (Fée) Maxon. Woods along trail to Morce's Gap. (211, 623)
36. P. RHIZOPHORUM (Jenman) Maxon. Hollymount-Moneague road. (474)
37. P. TRIANGULUM (L.) Fée. Variable. On rocks at Moneague and in woods near Ewarton. (412, 444, 516)

NEPHROLEPIS

38. N. BISERRATA (Swartz) Schott. One specimen found at Moneague. (518)
39. N. CORDIFOLIA (L.) Presl. Common in open places at Cinchona. (198)

TECTARIA

40. T. CICUTARIA (L.) Copel. Hollymount woods. (433)
41. T. CORIANDRIFOLIA (Swartz) Underw. Hollymount-Moneague road. (484)
42. T. HERACLEIFOLIA (Willd.) Underw. Variable. In open woods, Ewarton. (408, 438)
43. T. MARTINICENSIS (Spreng.) Copel. Near spring, three miles north of Ewarton. (405)

CAMPTODIUM

44. C. PEDATUM (Desv.) Fée. Hollymount woods. (443)

ODONTOSORIA

45. O. JENMANI Maxon. Common at Cinchona, the plants climbing over shrubs. (178, 613, 614)

DENNSTAEDTIA

46. D. CICUTARIA (Swartz) Moore. Large fern. Common. Morce's Gap. (282)

DIPLAZIUM

47. D. CENTRIPETALE Baker. Sir John's Peak trail, 5400 ft. (239)
48. D. COSTALE Swartz. In a shady gully near Morce's Gap (277)
49. D. SEMIHASTATUM (Kunze) C. Chr. Along the trail to Morce's Gap. A most beautiful species. (218)
50. D. WILSONII (Baker) Diels. In a shady gully near Morce's Gap. Only one specimen found. (279)

ASPLENIUM

51. A. ABSCISSUM Willd. Frequent at Cinchona and Hollymount. (217, 480)
52. A. ALATUM Humb. & Bonpl. A marked species with its broadly winged rachis. In dense gully at Morce's Gap. (280)
53. A. AURITUM Swartz. Hollymount-Moneague road. (481)
54. A. CIRRHATUM Rich. The fronds root at the tip as in our *Camptosorus*. Several well-marked varieties were collected. Cinchona. (216, 258)
55. A. DENTATUM L. Along Hollymount-Moneague road. (479)
56. A. FRAGRANS Swartz. A delicately cut fern. Sir John's Peak trail, about 5500 ft. (248)
57. A. PRAEMORSUM Swartz. A very striking species. Scarce. In dense woods along Morce's Gap trail. (300)
58. A. RESILIENS Kunze. Cinchona, about 5000 ft. (187)

GYMNOPTERIS

59. G. RUFA (L.) Bernh. A soft, velvety fern. In gully near Papine. (103)

LOMARIA

60. L. LINEATA (Swartz) Willd. Frequent in open parts of Sir John's Peak trail. (244)
61. L. POLYPODIOIDES (Swartz) Desv. Sir John's Peak trail, about 5800 ft. (230)

BLECHNUM

62. B. OCCIDENTALE L. A very common fern found everywhere. (182)
63. B. OCCIDENTALE var. MINOR Hook. Open places at Cinchona. (196)

FILIX

64. F. FRAGILIS (L.) Underw. Cinchona, near house. (311)

ANOPTERIS

65. A. HEXAGONA (L.) C. Chr. In densest portions of gully in Mt. Diabolo region. (438)

ADIANTUM

66. A. CONCINNUM H.B.K. On rocky banks of road east of Gordon Town. (331)
67. A. CRISTATUM L. In gully near Papine. (133) A form quite different, from Hollymount, has been tentatively placed here. (413)
68. A. CUNEATUM L. This has been introduced at Cinchona from Brazil. (546)
69. A. DELTOIDEUM Swartz. In crevices of rocks, Port Antonio. (537)
70. A. FRAGILE Swartz. Hollymount-Moneague road. (478)

71. A. LATIFOLIUM Lam. Along roadside a mile south of Port Antonio. (535)
72. A. MACROPHYLLUM Swartz. A handsome fern with unusually broad pinnae. (565)
73. A. MELANOLEUCUM Willd. Very common along roadsides at St. Ann's Bay. A great variation exists in the size of the pinnules. (455, 498, 510, 576)
74. A. PULVERULENTUM L. Quite common in Hollymount woods. (410)
75. A. PULVERULENTUM var. CAUDATUM Jenman. Hollymount woods. (437)
76. A. TENERUM Swartz. Frequent at Ewarton, Moneague, and St. Ann's Bay. (395, 502, 523)
77. A. TRAPEZIFORME L. A handsome fern with exceedingly large pinnules. Hollymount woods. (502a)
78. A. sp. Apparently a distinct species but as yet undetermined. In open places near Papine. (107)

HYPOLEPIS

79. H. NIGRESCENS Hook. Along trail to Morce's Gap. (282a)

PITYROGRAMMA

80. P. CALOMELAENA (L.) Link. Along roadside, Papine. (140)
81. P. SULPHUREA (Swartz) Maxon. One of the most beautiful ferns in the island, its fronds deep-green above with yellow powder beneath. It well bears the common name of "gold fern." At frequent intervals along the Content trail from 3000 to 1500 feet. (335)
82. P. TARTAREA (Cav.) Maxon. A much stouter fern with white powder beneath. Common at Cinchona. (197)

CHEILANTHES

83. C. MICROPHYLLA Swartz. Common in dry places. Long Mt., near Kingston; on stone fences, St. Ann's Bay. (39)

NOTHOLAENA

84. N. TRICHOMANOIDES (L.) R. Br. Content trail near the Yallis River. (334a)
85. N. TRICHOMANOIDES var. SUBNUDA Jenman. On rocks in open gully east of Papine. (108)

PTERIS

86. P. GRANDIFOLIA L. A large handsome once-pinnate fern with pinnae a foot long. Hollymount. (445)
87. P. LONGIFOLIA L. Common at various altitudes. Papine. (141, 250, 627)
88. P. QUADRIAURITA Retz. (form). Another striking member of this genus. Newcastle, about 2700 ft. (357)

HISTIOPTERIS

89. H. INCISA (Thunb.) J. Smith. In open places along the trail to Sir John's Peak. 5400 ft. (242a)

PTERIDIUM

90. P. AQUILINUM (L.) Kuhn (form). In open places, Cinchona, forming very dense masses along the trail to Sir John's Peak. (242)

PAESIA

91. P. VISCOSA St. Hil. Open places, Cinchona. (256)

POLYPODIUM

92. P. ANGUSTIFOLIUM Swartz. A peculiar fern with long, entire, very narrow fronds. Morce's Gap; in crevices of rocks at Hollymount. (306a, 475)

93. P. AUREUM L. var. ? One specimen found on a tree near Moneague. (454)
94. P. CRASSIFOLIUM L. A fern with entire fronds often three feet in length and a half a foot broad. Trail to Morce's Gap. (207)
95. P. CRETATUM Maxon. A dainty fern found on trees on Sir John's Peak at 5800 ft. (315)
96. P. CULTRATUM Willd. Depending from trunks of trees. Margins of pinnae very ciliate. Sir John's Peak trail, 5800 ft. (227)
97. P. CURVATUM Swartz. Trail to Moree's Gap. (209)
98. P. DELITESCENS Maxon. About an inch in height. On trees, Sir John's Peak trail, 5700 ft. (236)
99. P. LANCEOLATUM L. Sir John's Peak trail, 5100 ft. (253)
100. P. LORICEUM L. In open places, Cinchona, about 5000 ft. (184)
101. P. LYCOPODIOIDES L. Winding about trunks of trees, Moneague. (515)
102. P. MARGINELLUM Swartz. A fern with entire fronds growing in clumps on trees near the summit of Sir John's Peak. 6000 ft. (231, 319)
103. P. MYOSUROIDES Swartz. One of the smallest ferns collected. Scarcely an inch tall. On trees near summit of Sir John's Peak. (316a)
104. P. PECTINATUM L. Along trail to Moree's Gap, about a mile north of market-place. (204)
105. P. PHYLLITIDIS L. With long, leathery simple fronds, bearing very small fruit-dots. (428a)
106. P. PILOSELLOIDES L. Climbing over rocks near the juncture of the Hollymount and Ewarton roads. (465)
107. P. PLUMULA H.B.K. In open places, Cinchona. In gully near Papine. (105, 204a)

108. P. POLYPODIOIDES (L.) A. S. Hitchc. Common at lower altitudes. Papine and Long Mt., near Kingston. (37, 140)
109. P. REPENS Aubl. Fronds one to two feet high. Winding about trees at Hollymount. (428)
110. P. SUSPENSUM L. Winding about trees with fronds hanging downward, forming thick masses. A very characteristic fern of the deep, cool forests along the trail up Sir John's Peak. (226)
111. P. TRICHOMANOIDES Swartz. On trees near the summit of Sir John's Peak. (316)

OLEANDRA

112. O. ARTICULATA (Swartz) Presl. Fronds shiny, resembling a *Polypodium*. Twining about trees. Hollymount. (427)

OLFERSIA

113. O. CERVINA (L.) Kuntze. Hollymount. (450, 426)

ELAPHOGLOSSUM

114. E. CHARTACEUM (Baker) C. Chr. Sir John's Peak trail, 5500 ft. (241)
115. E. CINCHONAE Underw. Cinchona, about 5000 ft. (206)
116. E. HIRTUM (Swartz) C. Chr. Thickly covered with light brown scales. On trees near summit of Sir John's Peak, 6000 ft. (232)
117. E. LATIFOLIUM Swartz. Sir John's Peak trail, 5500 ft. (241a)
118. E. MUSCOSUM (Swartz) Moore. Morce's Gap trail. Specimens in fruit seem to be scarce. (209a)
119. E. VILLOSUM (Swartz) J. Smith. Covered with long hairs. At summit of Sir John's Peak, 6100 ft. (232a)

TRISMERIA

120. T. TRIFOLIATA (L.) Diels. Papine: Newcastle. (110)

STENOCHLAENA

121. S. sp. Sterile fronds only. Hollymount. (434)

Gleicheniaceae

DICRANOPTERIS

122. D. BANCROFTII (Hook.) Underw. Sir John's Peak trail, 5400 ft. (251)
123. D. BIFIDA (Willd.) Maxon. In open places, Cinchona. (588)
124 D. JAMAICENSIS Underw. Open places along trail to Sir John's Peak, 5900 ft. (235)
125. D. PECTINATA (Willd.) Underw. Common at Cinchona. A form of this was collected, verging toward *D. flexuosa*. (210)

Schizaeaceae

ANEMIA

126. A. ADIANTIFOLIA Swartz. Common along roadsides from Ewarton to St. Ann's Bay and Roaring River Falls. (441)
127. A. HIRSUTA Swartz. On dry banks along roadsides from Gordon Town to Newcastle. (369)

Marattiaceae

MARATTIA

128. M. ALATA Swartz. A large fern along trail to Sir John's Peak, about 5800 ft. (219)

Ophioglossaceae

BOTRYCHIUM

129. B. DICHRONUM Underw. In moist woods, Sir John's Peak trail, 5500 ft. Somewhat resembling our *B. virginianum*. (240)

130. B. UNDERWOODIANA Maxon. One specimen found about two miles east of Cinchona. (616)

Lycopodiaceae

LYCOPODIUM

131. L. CLAVATUM L. Common at Cinchona. (212)
132. L. CURVATUM Swartz. Frequent along trail to Morce's Gap. (213b)
133. L. FAWCETTII Lloyd & Underw. Not common. Cinchona. (213a)
134. L. JUSSIAEI Desv. Two miles east of Cinchona. Along Sir John's Peak trail (204)
135. L. REFLEXUM Lam. Frequent at Cinchona and Newcastle. (257, 387)
136. L. TAXIFOLIUM Swartz. Bears a superficial resemblance to Ground Hemlock. Near summit of Sir John's Peak. 6000 ft. (327)

Selaginellaceae

SELAGINELLA

137. S. DIDYMOSTACHYA (Desv.) Spring. Trail to Morce's gap. (213d)

A large striking *Selaginella* of a bluish-green color is found as an escape at Hollymount. (466)

ROCHESTER, N. Y.

A New Station for Trichomanes Petersii

E. W. GRAVES

On the 24th of October, 1916, Mr. A. H. Howell, of the United States Biological Survey, and myself started on a trip toward the south end of Sand Mt., Alabama. Sand Mt. is an elevated plateau ten miles wide, extending from near the Tennessee line southwest about one hundred miles into Alabama. It lies about one thousand feet above the Tennessee River.

The mountain is cut up by many deep gorges which empty the water of the tableland into the Tennessee River which lies to the west. Growing along these cool, damp gorges one will find a varied flora. There occurs a strong mingling of types that are at home in the Alleghenian area of the adjoining states and of North Carolina with plants of the lower ranges within the Carolinian area, the like of which has not been observed in any other part of the mountain region of Alabama. Among the woody plants peculiar to the Alleghenian area. *Rhodendron catawbiense* and *Tsuga canadensis* are the most prominent. Among the more rare ferns one finds *Asplenium Bradleyi*, *A. montanum*, *A. pinnatifidum*, *A. Trichomanes* and occasionally *Pellaea atropurpurea* growing along the sandstone cliffs, and lower down, where the creek bed has been cut into the limestone shales, *Camptosorus rhizophyllus* and *Dryopteris spinulosa intermedia* occur. Where the sandstone is kept continuously wet one will find an occasional bed of *Trichomanes radicans*.

On the 29th, Mr. Howell and I decided to make a camp in the Santy Creek gorge which in this place is the boundary between Jackson and Marshall Counties. Of course, water would be the first necessity in a camp; I therefore set out to find a spring. After locating a ravine which emptied into the gorge, I followed it for

several rods, climbing over moss-covered rocks and fallen trees. I finally reached a pool of water at the foot of a gigantic rock on one side and a rocky cave on the other, with only a passage of a few feet between for the water coming down the ravine to pass through. Between the cave and the rock the water passed down a steep incline, striking a pile of loose rocks at the bottom, causing it to send a spray over the rock.

On the lower corner it appeared a cube had been broken from the top of the rock, making a shady nook in which grew a dense colony of *Polypodium vulgare* and just below, on two sides of the rock, some two or three feet above the pool of water, grew several colonies of *Trichomanes Petersii*. I at first thought it was moss, but on closer examination I found it to be the rare fern.

The accompanying photograph shows this rock with the writer standing in the gully beside it. The little *Trichomanes* is too small to be made out in the picture, but there is one colony just in front of my hand, a smaller colony lower down and back of my hand, and a larger colony on the face of the rock on the side toward the large tree, which covers a space perhaps two feet wide and four long, extending from the upper edge just under the *Polypodium vulgare* down nearly to the ground. At my feet is the pile of rocks against which the water strikes, making a spray which keeps the large rock damp. Very little water was running at the time of my visit.

Trichomanes Petersii had been found only in Winston, Etowah and Marion Counties, but my find adds a fourth station for Alabama.

LONG ISLAND, ALA.

Through the courtesy of Dr. B. L. Robinson, of the Gray Herbarium, and the kindness of the artist, Miss Una L. Foster, the JOURNAL is able to present the accompanying detailed illustration of *Trichomanes Petersii* (Plate 3). All the drawings except Fig 1.

Ravine in Buck's Pocket. *Trichomanes Petersii* growing on rock in fore-ground.
(Photograph reproduced by courtesy of the Bureau of Biological Survey, U. S. Dept. of Agriculture)

were made from the type specimens collected by Judge Peters in 1853. D. C. Eaton in The Ferns of North America, **1:** pl. 24, gives a life-size drawing of a plant of *T. Petersii* and an enlargement of a single frond showing an involucre with the receptacle much more exserted than in any specimens I have seen and more than his description calls for. He does not state where the material from which this drawing was made came from. Miss Slosson in Bull. Torrey Bot. Club **41:** pl. 7 has a good photographic illustration of specimens from Santo Domingo. But, so far as the editors are aware, our plate is the first in which the species has been figured in full detail. **C. A. W.**

Explanation of Plate 3: Fig. 1, plant, natural size, from specimen collected at Santy Creek gorge, Marshall Co., Ala., by E. W. Graves, Nov., 1916; Fig. 2, fronds × 2; Fig. 3, portion of edge of frond, showing hair and "false vein" × 45; fig. 4, portion of lip of involucre × 45; Fig. 5, involucre × 10; Fig. 6, portion of receptacle and sporangia × 30; Fig. 7, sporangia × 45; Fig. 8, spores × 45.

The Ferns of the Lake George Flora, N. Y.

IV

STEWART H. BURNHAM

ATHYRIUM THELYPTEROIDES (MX.) DESV.

Moist woods; frequent. Aug.–Oct.

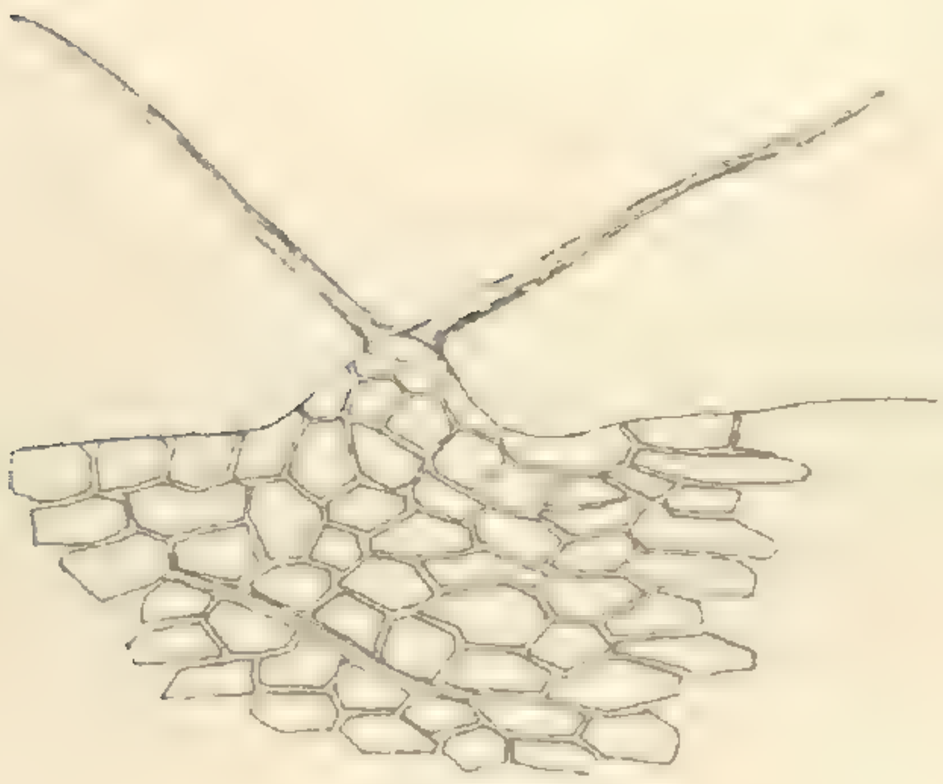
This fern seems to be generally distributed: but is not very abundant at any station.

ATHYRIUM FILIX-FOEMINA (L.) ROTH.

Woods, fields and roadsides in moist shaded places; abundant. July–Sept. Very variable.

The var. **Michauxii** (Spreng.) n. comb.,[1] with narrow fronds, has been found at Luzerne (Peck); and Dark Bay, Lake George (Hulst).

[1] The synonymy of this variety is as follows: *Aspidium angustum* Willd., Sp. Pl. **5:** 277. 1810. *Asplenium Michauxii* Spreng. Syst. **4:** 88. 1827. *Asplenium Filix-foemina*, var. *Michauxii* Mett. Aspl. 199. 1859. *Athyrium asplenioides*, β *angustum* Moore, Ind. Fil. 179. 1860. *Asplenium Filix-foemina*, var. *angustum* D. C. Eaton, Ferns of the Southwest in Bot. Wheeler's Exp. 330. 1878. *Michauxii*, being the earliest varietal name given to the plant, should be used, under present nomenclatorial rules.



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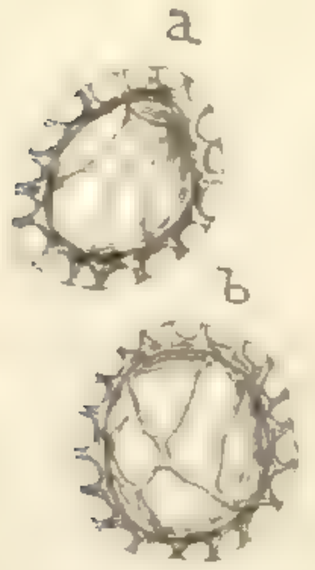

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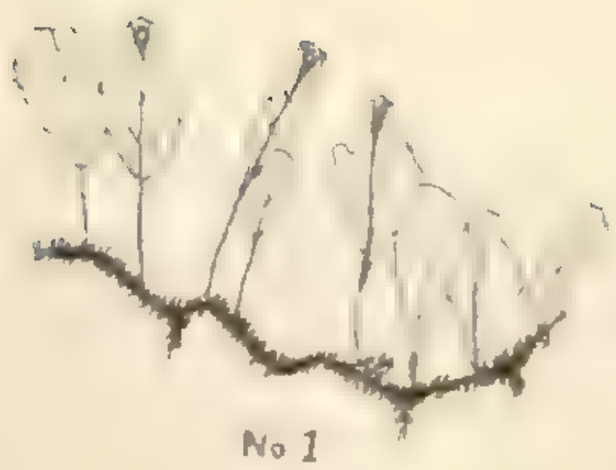

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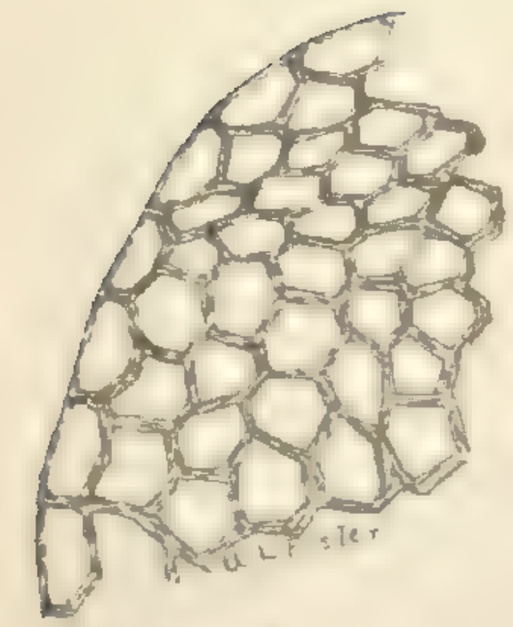

No 4

No 6

No 5

TRICHOMANES PETERSII GRAY

The var. LATIFOLIUM Bab. with broad fronds, has been found about Lake George; southern W. Fort Ann; Crescent and elsewhere.

ADIANTUM PEDATUM L.

Rich moist woods and shaded banks; common. July–Oct.

Young plants, collected in Devines woods, Vaughns, June 12, 1897, had broad triangular pinnules suggestive of *A. Capillus-Veneris*.

PTERIDIUM AQUILINUM (L.) Kuhn

Dry fields and thickets, usually in sandy or gravelly soil; common.

A tall fern sometimes forming bracken thickets on open hillsides. The pinnules are sometimes distorted by the fungus *Phyllachora Pteridis*.

CRYPTOGRAMMA STELLERI (Gmel.) Prantl

Shaded limestone cliffs; rare. June–Aug.

Near Whitehall (Dr. Beck). Torrey's N. Y. State Flora **2**: 487. 1843. These specimens were preserved in an old collection at State Herbarium. Silver Bay (Kemp); waterfall on south shore of South Bay; Pinnacle, Fort Ann mountains; Haynes hill, Vaughns; limestone ledge 1½ miles north of Smiths Basin, east of old Champlain canal, May 12, 1904. This station has probably been destroyed in building the barge canal.

PELLAEA ATROPURPUREA (L.) Link

Dry limestone rocks; very rare.

Dr. M. W. Vandenburg during the seventies found a few plants on the cliffs on the south bank of the Hudson river near Glens Falls, where in recent years much rock has been removed; Silver Bay (Kemp), 1902; Dresden (Peck); three plants on the granitic talus at the base of

Diameter, South Bay, July 31, 1893; Skenes Mt., Whitehall, Aug. 30, 1900, also found here Aug. 1911 by D. S. Carpenter & F. T. Pember.

POLYPODIUM VULGARE L.

Rocky woods and ledges; common, especially in mountain woods.

Variable. Plants with fruiting fronds 1¼ inches high were met with in the dry old pasture on Woodruffs hill, west of Fort Ann, 1896. Along the road a mile west of Lake Sunnyside, 1908, plants were seen growing in sandy soil at the base of trees. In Devines woods, west of Kingsbury, 1899, plants were collected with long narrow thick fronds. Although this evergreen fern usually cushions limestone and granitic rocks, it is sometimes met with on the roots of trees.

At Lake George C. L. Williams collected in 1909, and Mrs. S. W. Russell in 1910 at Hillview, sterile plants of this species. "The fronds are 5–12 cm. long, ½ cm. broad, sinuate lobed or irregularly pinnatifid. the lobes being broad, obtuse and unequal." N. Y, State Mus. Bull. **150:** 47. 1911.

Forms with taper pointed fronds, often 3 inches wide, with nearly entire rather thin pinnae, with a few fruit dots were referred to var. *angustum* Muell. This form has been collected on Black Mt.; Fort Ann mountains; and southern W. Fort Ann.

The var. CHURCHIAE Gilbert was found by Miss Alice Church on the old well of Ft. George, Lake George, Sept. 1905. One plant was found and a type frond was preserved in the Gilbert herbarium. Fern Bull. **14:** 39–41. April 1906.

Dr. Geo. D. Hulst, during the nineties, found at Dark Bay, Lake George, specimens of var. CAMBRICUM (L.) Willd. under hemlock trees; and the var. MULTIFIDUM Moore. "The tallest and least variable fronds simply

fork once or twice at the apex, and are an incipient form of the variety *cristatum*." Specimens were deposited in the Columbia Herbarium: and a specimen of var. *multifidum*, which grew on a sloping rock along the cascade of the brook, was found in the Hulst herbarium. Fern Bull. **7**: 34. April 1899.

Forms, approaching var. *deltoideum* Gilbert, were found on the granitic talus at the foot of Diameter, near the natural "ice-house," South Bay, Oct. 6, 1903; also one frond of var. RAMOSUM Moore. Fronds forking at the apex, or with the pinnae forked, were found. The South Bay plants, of *deltoideum*, are quite similar to figure 3, illustrating J. C. Buchheister's article, "Variations in the Common Polypody," Am. Bot. **5**: 56. Sept. 1903. Specimens with partly lobed pinnae were found near the summit of Saddle Mt., Fort Ann mountains, Sept. 27, 1899, and were sent to Dr. Davenport.

Equisetaceae

EQUISETUM ARVENSE L.

Moist sandy, clayey and alluvial soil; common. April 20–May.

Variable. The fertile, unbranched stems disappear early in the season; the sterile stems, much branched, appearing later. This plant is locally known as "Cold Pine"; because of its branching stems, and the soil in which it grows is supposed to be wet and cold. It is often a weed in cultivated fields. Sterile plants sometimes have 3-angled stems and the sheaths of the branches 3-toothed.

The form DECUMBENS (Meyer) Luerssen has been found, along the roadside, east of Lake Hadlock, W. Fort Ann.

The form DIFFUSUM (A. A. Eaton) Clute, along the sandy roadside, north of Moss Street schoolhouse, north of Hudson Falls.

The form NEMOROSUM (A. Br.) Klinge, at Hague in woods.

The form RIPARIUM (Fries) Klinge, in alluvial sand, north bank of Halfway brook, east of Tripoli. Determined by A. A. Eaton, Dec. 1900.

EQUISETUM SYLVATICUM L.

Moist shady places; frequent. May.

The fertile stems usually bear a few branches and are later quite similar to the sterile ones which appear in early summer.

EQUISETUM PALUSTRE L.

Very rare. Fort Edward: a specimen was found in the Dr. E. C. Howe herbarium labeled as *E. pratense* Ehrh.

EQUISETUM FLUVIATILE L.

Shallow water and alluvial soil: infrequent. May-June. Although not common it is distributed from Lake George to Shushan.

The stems of this species are often unbranched: but plants bearing more or less verticillate branches, the form VERTICILLATUM Doell. occurs near Tripoli and at Vaughns.

EQUISETUM HYEMALE L.

Steep ravine banks, more often in sandy soil: sometimes persisting in old meadows; frequent but rather local. April 20–June.

Variable. The stems usually unbranched and are evergreen. Small bundles of the stems are used for scouring floors, tables, etc. This species is also found on dry railroad embankments.

Our common variety is *affine* (Eng.) A. A. Eaton: but the branching form RAMOSUM A. A. Eaton of this variety sometimes occurs.

The var. PUMILUM A. A. Eaton has been found on shaded sandy banks of Pond Brook, west of W. Fort Ann P. O.

EQUISETUM VARIEGATUM Schleich.

Very rare. Mohawk river bank at Waterford, Aug. 27, 1904.

EQUISETUM SCIRPOIDES Mx.

Low woods and ravines, preferring clayey soil; infrequent. April–May.

Gansevoort (Peck); DeRidder hill near Schuylerville (Greenalch); Hague; southern W. Fort Ann, not rare; Hudson Falls and vicinity; Glen Lake.

This small evergreen species was first named for me by the late Dr. A. W. Chapman, March 17, 1892, who said, "very rare to me." It fruits sparingly.

Lycopodiaceae

LYCOPODIUM LUCIDULUM Mx.

Cool wet woods; frequent. Aug. Nov.

This species is usually found about ponds, specially at higher elevations. The sporangia are borne in the axils of the upper leaves. The plant is also propagated by bulblets.

LYCOPODIUM INUNDATUM L. ✦

Very rare. Sphagnum marsh at north end of Podunk Pond, Aug. 16 and Oct. 17, 1899: Sept. 13, 1900: Aug. 17, 1913; sandy moist roadside, near northwest shore of Lake Hadlock, Oct. 6, 1910, and Oct. 9, 1911: not found here, Nov. 1915.

LYCOPODIUM OBSCURUM L.

Moist woods in elevated regions; frequent. Aug.–Oct.

This and other species of club-mosses are sometimes known as "Mountain Boy."

Plants with more erect branches, with leaves all alike, which is known as the var. DENDROIDEUM Mx., are sometimes met with.

LYCOPODIUM ANNOTINUM L.

Mountain woods, specially about ponds; local and infrequent. Aug.–Oct.

Black Mt. (Hulst); mountains near East Galway (Burt); Crosset Pond to lower New Michigan, W. Fort Ann.

The spikes are usually solitary at the ends of the simple or forked ascending branches.

LYCOPODIUM CLAVATUM L.

Dry woods, specially in elevated districts; frequent. Aug.–Oct.

Extensively creeping along the surface of the ground: fruiting spikes 2 or 3, peduncled.

The var. MEGASTACHYON Fernald & Bissell was formerly confused with the variety *monostachyon*. It was erroneously stated that Dr. Peck collected it in "Washington county," Rhodora **7:** 96. May 1905. This variety, bearing one spike, was collected on the moist rocks by the roadside, west of Lake Hadlock. Nov. 19, 1915.

LYCOPODIUM COMPLANATUM L.

Dry woods and pastures; common. Aug.–Oct.

Very variable. A variety with acuminate leaves occurs in the pine woods near Fort Edward reservoir. Aug. 30, 1902.

Extensively creeping just below the surface of the ground; fruiting spikes 2–3, peduncled. This with the preceding species are often used for winter decoration. All the above mentioned species may be found about

Podunk Pond (Lake Nebo). Our plant is var. *flabelliforme* Fernald.

LYCOPODIUM TRISTACHYUM Pursh

Dry woods and pastures; scarce. Aug.–Sept.

Pasture ¾ of a mile west of Vaughns schoolhouse; west of Tripoli; foot of Sugar Loaf and Peaked mountains; Sly Pond; woods northeast of Hudson Falls; woods north of Cambridge.

Differs from the preceding species, by the rhizomes creeping 1–2 inches below the surface of the ground; the leafy branches more erect and less spreading; the leaves less dimorphous. This species commences to scatter its spores about Sept. 1; *L. complanatum*, var. *flabelliforme*, about Oct. 15, at Vaughns.

Selaginellaceae

SELAGINELLA RUPESTRIS (L.) Spring

Dry exposed granitic rocks, specially in elevated regions; rather widely distributed in the northern part of the region. July–Oct.

This inconspicuous moss-like plant is rarely met with at lower elevations. In the southern part of the range it has been found on Peaked Rock, east of Shushan: on Willard Mt.; and at Crescent.

SELAGINELLA APUS (L.) Spring

The only station discovered for this rare plant was at Bolton (?), Lake George (!), (C. H. Hall), July 1880.

This small *Selaginella* resembles a *Mnium*, but may be distinguished by its two kinds of leaves.

Isoetaceae

ISOETES BRAUNII Durieu

Usually submerged; very rare.

"Outlet of Luzerne Lake, Warren Co. A very small form; Aug. 1867: G. W. C(linton)." N. Y. State

Cab. Rep't **20:** 409. 1867. This specimen is in the State Herbarium. Round (Trout?) Lake, above Bolton, west of Lake George in white sand (L. Lesquereux). Engelmann, "The Genus Isoetes in North America," Trans. St. Louis Acad. **4:** 379. 1882. One plant from rather deep water, muddy bottom of Crosset Pond, W. Fort Ann, Aug. 25, 1897.

Isoetes echinospora muricata (Durieu) Engelm. has been found at "Lake Luzerne, A. A. Eaton." Gilbert, "The Fern Flora of New York," Fern Bull. **11:** 103. Oct. 1903.

ISOETES ENGELMANNI A. Br.

Found in a setback of the Battenkill River at Battenville, between Greenwich and Shushan, Aug. 2, 1912, (Dobbin). Very abundant: and muskrats were fond of the bulbous bases.

This interesting genus is often overlooked, and it requires considerable experience before quillworts can be distinguished from other grass-like water plants with which they grow.

HUDSON FALLS, N. Y.

Notes and News

OPHIOGLOSSUM VULGATUM—ONCE MORE! The *Ophioglossum* seems to excite so much interest that I may perhaps be pardoned for offering my experience with that interesting little plant. The only time I have found it was ten years ago near the summit of Mt. Wismer on the boundary between Monroe and Pike Counties, Pa., at an elevation of about 1800 feet. There were about half a dozen or more plants growing where the soil could not have been more than six or eight inches thick on top of the bed rock. Needless to say the location was exceedingly dry. I took up four plants

and transplanted them to my fern garden at Buck Hill Falls, Pa., where they have done very well, though the location is too dry to be an ideal one for ferns. Though these four plants bear fruiting fronds each year, there has been no increase in their numbers, either from spore growth or from buds from the roots.

Two years after I had obtained my specimens I returned to the place but saw no more plants of the kind, either there or in the neighborhood, nor in frequent visits since have I ever found a single specimen. I never am in a damp meadow without being on the lookout for Ophioglossum, but have never been rewarded by finding any.

WALTER MENDELSON.

OPHIOGLOSSUM BUDDING FROM A ROOT. An herbarium specimen sent in by Mr. Winslow from a collection made in Vermont, seems to show indubitable evidence of the development of a new plant of *Ophioglossum vulgatum* from a root. On the specimen on question, a small plant appears attached near the end of a long root of a large fertile plant.

FERNS OF LAKE SPOONER. Lake Spooner (formerly called Mud Lake) is about three miles from the town of the same name in Washburn County in northwestern Wisconsin. It is a narrow, irregularly shaped lake and contains four wooded islands. It is fed by Mud Creek and drained by the Yellow River, a tributary of the St. Croix. The country about the lake was once covered with extensive forests of white pine, now nearly all cut down. A few years ago the author made an intensive study of the vegetation of one of the islands and listed seven ferns. Since then the oak and the spinulose wood ferns have established themselves on this island; while

the adder's tongue found in one small area, has now been submerged by the rising of the lake since a new dam was put in its outlet.

The following list gives the ferns found as the result of a rather thorough search of the immediate border of the lake and the islands and one point upon Yellow River.

Phegopteris dryopteris (L.) Fée	oak fern
Adiantum pedatum L.	maidenhair
Pteris aquilina L.	common brake
Asplenium filix-femina (L.) Bernh.	lady fern
Aspidium spinulosum (O. F. Müller) Sw.	spinulose wood fern
Aspidium cristatum (L.) Sw.	cristate wood fern
Onoclea sensibilis L.	sensitive fern
Onoclea struthiopteris (L.) Hoffm.	ostrich fern
Osmunda claytoniana L.	interrupted fern
Osmunda cinnamomea L.	cinnamon fern
Ophioglossum vulgatum L.	adder's tongue
Botrychium virginianum (L.) Sw.	rattlesnake fern

Osmunda cinnamomea L., var. *incisa* J. W. Huntington was found this summer in one situation in the Dells of the Wisconsin River.

RUTH MARSHALL.

The following, from a letter of Mr. Alexander W. Brown's, should be of interest to members who want to grow foreign ferns in their gardens. Mr. Brown writes:

"I brought a plant [of *Lomaria Spicant*] with me from Scotland four years ago, and it seems to thrive well in my little fern corner, throwing up lots of fronds, both barren and fertile. . . . I am quite pleased with my experiment with this fern, as I dug it up in a wood where the famous battle of Harlaw took place. A resident told me the thermometer never fell below 18 above and never rose higher than 75. Here it seems to have

suffered no inconvenience in a temperature which has ranged from 20 below to 100 above. It gets protection of leaves in winter."

American Fern Society

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Experiences with a Fern Garden—I.

C. L. GRUBER

In 1911 I started a fern garden. The space used for this purpose is only a small bed, twenty-five feet long and about four and one-half feet wide. I built a small rock pile at one end and a larger one, shaped partly like a horse-shoe, in the middle. The bed consisted of good but rather heavy garden soil and after trying to grow ferns I found that most species did not thrive well in it; so in August, 1913, I dug the ground out to the depth of four inches, as close to the planted ferns as possible without jeopardizing their growth, and filled in the excavations with leaf mold and woods ground mixed with some fine sand, decaying wood, and a small quantity of crushed limestone. A marked increase in growth and vigor was the result. The small garden slugs proved themselves a source of annoyance by devouring the young crosiers, particularly those of the more tender species, as soon as they appeared above the ground. The grape ferns, rattlesnake ferns, walking leaf, and adder's tongue suffered especially in this way. I finally overcame this difficulty by covering the surface of the bed with fine sand, over which the slugs were unable to drag their slimy bodies. The bed is partially shaded by a cherry tree and a pear tree and the soil is only moderately moist. At the summier end of the bed I planted a few sweetbriers to furnish additional shade. A covering of leaves in the fall with a fresh coating of sand in the spring keeps the bed in good condition.

[No. 2 of the JOURNAL (7: 33–66, Plates 2 and 3) was issued May 5, 1917.]

Occasionally, during drought, it becomes necessary to supply some species with water at intervals of a few days to keep them in healthy growth. While all species appreciate this treatment, it may become specially necessary for the cinnamon fern, walking leaf, marsh fern, and perhaps a few others.

Since it takes two or three years for ferns to become fully established and to attain their natural thrifty appearance, no record of growth was kept in 1912. The date when they began growing in spring was recorded when the crosiers had appeared above ground sufficiently to expose the entire coiled portion.

The shield ferns, in general, are easy of cultivation. In July, 1911, I planted three marginal shield ferns on the fern bed and in September of the same year I set ten of these common ferns in a row along a side porch. All of them grew well. In the spring of 1913, individuals started growing from April 23 to April 30. The spring of 1913 was perhaps slightly earlier than usual, but in 1914 spring came tardily and the marginals began growing from May 4 to May 12. The row along the porch starts close against the wall of a cellar containing the heating furnace and extends outward seven feet. In 1915, an average spring, the ferns of this row began growing in order of their distance from the warm cellar wall, from April 23 to May 9. By June 21, some of the spores were ripe. Practically all of them were ripe on the first fertile fronds by the end of June. While the fruit dots, or sori, of the marginals seem purple and give a beautiful appearance to the under side of the frond, the indusium is really light violet and the characteristic color is imparted by the rich purple or brown-purple spore cases, or sporangia, underneath. After the spores are scattered, the indusia turn light brown. On the later fertile fronds developing in August and September, the fruit dots are frequently not so richly

colored. Partly fertile fronds are occasionally found among the sterile fronds appearing in July and August.

Two spinulose shield ferns of the regular type and three of the variety *intermedium* were set in the fern bed in July, 1911, and one apparently of the variety *dilatatum* was planted in August, 1914. While all of them grew nicely, they seem to require a richer soil than the marginals to reach the same degree of development. They began growing during the last week in April with the exception of one vigorous plant, which started to grow on April 19, and one old one, which did not show any activity until May 4. The first fronds are mostly fertile. Occasional fertile or partly fertile fronds appear with the sterile fronds in June and July. By June 7, some of the spores were ripe, and by the 20th of June, light brown fruit patches were all that remained to mark the places that had been filled to overflowing with the beautiful black or black-purple spore cases. The true spinulose shield fern is found in this locality only occasionally, the variety *intermedium* is fairly common, but the variety *dilatatum*, or at least a form that resembles it, is decidedly rare.

From a muddy spot near the foot of the mountain I brought a crested fern and planted it in my fern garden in July, 1912. Although I could not provide it with a swampy home, it grew and thrived in its new situation for a few years until some vigorous lady ferns encroached upon the space allotted to it and gradually crowded it out. In October, 1914, I transferred another crested fern, from a rather wet meadow border, to my fern bed; and this one is multiplying and flourishing in a very satisfactory manner, its erect fertile fronds, with their horizontal pinnae, marking it with characteristic distinctness. The crested fern began to grow from April 25 to May 2, although some of the fronds on the oldest part of the largest fern did not appear until May 10.

The pale tan to violet-tan fruit dots were coloring well by June 9, and the violet-brown to dark purple-brown spore cases ripened on the several fronds from June 14 to June 30. In the crested fern, the fertile fronds are decidedly the first to appear, in spite of the fact that a few small sterile fronds occasionally appear with or even before the fertile ones; and the actual growth of sterile fronds does not begin until late in June or in July. Some of these sterile fronds are occasionally partly fertile.

Goldie's shield fern is very rare in this region, but I was fortunate in finding a fine colony in a mountain ravine and in August, 1911, I planted two of these ferns in a recess at the base of the rock pile in my fern garden. They grew well in their new home, the young ferns appearing from April 26 to May 4. By about the 10th of June the indusia covering the flat sori are pale violet, later changing to straw color, and during the last week in June the spore cases have ripened and are light brown to rather dark brown in color. The new fronds appearing during the latter half of June and in July are mostly sterile, but some of them are fertile on the upper portion.

The New York fern does not flourish so well as it does in the habitat from which it was transplanted. In July, 1911, I planted two of these ferns, one on the fern bed and one close to the wall of the house. By 1913 the plant on the fern bed had died and in August, 1914, I planted another one in its place. Although both of the plants are gradually establishing themselves, sending up each succeeding spring, about April 28, an increasing number of slender crosiers, the fronds have so far failed to attain the length to which they grow in the wild state. The first fronds, as a rule, are sterile, and usually a large percentage of the fronds grown during the season do not fruit. The fertile fronds begin to appear about the third week in June and the shining dark brown to nearly black sporangia begin to ripen

during the last week in July, the majority not ripening until the middle of August. Some fronds appear in August and these are sterile or only partly fertile.

In September, 1911, I transferred a marsh fern from a small marsh, where its rootstocks were buried in mud, to my fern bed; and in spite of the drier situation, it flourishes and multiplies, forming a close stand and spreading outward on all sides. In 1915, a few crosiers showed their green heads as early as March 27, but the sterile fronds usually begin growing about April 23, while the narrower fertile ones appear during the latter part of July and early in August, the dark brown or black spore cases ripening during the latter half of August.

The male fern is not found in this part of the country, so I bought a plant for my fern garden, in May, 1911; and it grows beautifully. Several young plants formed on the side of the original rootstock. I transplanted one of these in September, 1914, and I now have two splendid clumps of fronds. The younger fronds around the outside of the plant begin to grow about April 24, but those on the oldest part of the original rootstock usually do not appear until the first week in May, but in 1913 they actually delayed their coming until May 20 and the first ones of these were mostly stunted and poorly formed. Probably as a result of this poor growth, the fern fruited sparingly and the spores did not ripen till the middle of July; but in following years the fruit ripened during the second week in June, the violet-purple sori with their blackish brown sporangia presenting a beautiful appearance, looking like two rows of ornaments and closely resembling the fruit dots of the marginal shield fern in color, but not in position. The first fronds are mostly fertile, but fertile and sterile fronds, some of them only partly fertile, continue to appear late in June and in July. The indusia are pale yellow before the ripening stage begins.

The cinnamon fern, interrupted fern, and royal fern although frequenters of moist situations, continue to grow well in my fern garden. The fronds, however, fail to grow to the length which they attain in the wild state; and the cinnamon fern seems to suffer most in this respect. Three cinnamon ferns, two large plants and a small one, found a home in my fern garden in May, 1912. During the following years the older plants started their spring growth, the fertile fronds coming first, from April 21 to May 1. The sterile fronds appeared a week to ten days later. The fertile fronds are surrounded by the sterile ones, but a careful investigation will show that the fertile fronds actually arise from the outer circle while the sterile fronds, by strongly curving outward at their bases from the central part of the plant, appear to arise around the outside. The spore cases, at first light cinnamon, but soon turning cinnamon-brown, ripened from May 20 to May 25, all the spores had fallen by the beginning of June, and within a few days, by the end of the first week in June, the fertile fronds began to wither, soon bending or curving over in humble recognition of duty well performed; but some traces of them could still be found late in August.

In July, 1911, I planted two interrupted ferns on the bed and one along the wall of a side porch. Those on the fern bed began growing in spring from April 15 to April 21, but the one along the porch, standing in the natural soil and in a more exposed situation, usually came about a week later. By May 15 or 20, the cinnamon-brown sporangia were ripe and all the spores were shed within a week. The fruiting pinnae at once began to wither, but remained hanging, limp and brown, till September or later. As in the cinnamon fern, the first fronds are fertile and the sterile ones come about a week later. Each year some, and one year nearly all, of the fertile fronds of the plant at the porch have no sterile

pinnae, or only a few stunted ones, beyond the fertile pinnae. This condition apparently is produced by injury caused by strong winds whipping the tender young plants against the porch wall; but one year one of the fronds on the fern bed had no sterile pinnae above the fertile ones and only one stunted one below.

I planted two royal ferns in the fern bed in August, 1913, and in each of the three following years one began growing about April 21 and the other about April 26. Sterile and fertile fronds appear at the same time, some sterile fronds coming as late as July 15. The sterile parts of the fronds are colored light salmon or light purplish cinnamon when unfolding and the fertile portion is light green, sometimes tinged with yellowish. The mature fruiting part of the frond is dark cinnamon-brown and the dark green sporangia have ripened about May 25 and all have fallen by June 1, the fruiting portion remaining till late in July.

KUTZTOWN, PA.

(To be continued)

Notes on Hippochaete[1]

OLIVER ATKINS FARWELL

HIPPOCHAETE LAEVIGATA.

In a friendly criticism of Standley's Ferns of Greene Co., Mo., Mr. B. F. Bush, in the AMERICAN FERN JOURNAL for October-December, 1916, adopts the name *Equisetum Kansanum* Schaffner for the smooth annual-stemmed species that for many years has passed for *Equisetum laevigatum* Braun, transferring the latter name to the perennial plant that was later described as *Equisetum hyemale* var. *intermedium* by A. A. Eaton,

[1] In Mem. N. Y. Bot. Gard. **6:** 461 ff., Mr. Farwell gives his reasons for separating the scouring-rushes from the true horse-tails as a separate genus under the name of *Hippochaete*.—Ed.

once more exemplifying the wholly unsatisfactory and entirely indefensible method of adopting the herbarium specimens of older authors as types when said authors did not so consider them. The writer hasn't much sympathy with the modern custom of making a dried specimen, in most instances only a fragment of a plant, a specific type. Herbarium specimens are too notoriously unreliable. They may be destroyed, mutilated, lost, interchanged, mislabeled, and, except in the case of very small herbaceous species, do not give one the slightest conception of the habit of the species; again in the distribution of exsiccatae two or more species are frequently sent out under the same number and name and consequently the co-type may not always be the same as the type. *Descriptions* are the *real types* and herbarium specimens, like plates, are but illustrations of the species and sometimes, for one or another of the above named causes, are only a means to added confusion. The transfer of name was made because of the discovery in the Herbarium of the Missouri Botanical Garden of a so-called co-type of *Equisetum laevigatum* Braun which proves to be the *Equisetum hyemale* var. *intermedium* of A. A. Eaton. It seemed rather peculiar to me that Engelman, who supplied the material for the description and who as translator and editor of Braun's MSS. is the sponsor, in a measure, of the species, should have so misunderstood his own species as to have misapplied it and to have permitted such misapplication in our manuals without having called the attention of their authors thereto. A careful study of the original description will show that Braun's species has not been misunderstood, that his description applies to the annual-stemmed plant that has been passing under Braun's name. It is true that Braun thought *E. laevigatum* to be a perennial-stemmed species, but at that time all American species of this group were so con-

sidered, and it has not been until very recently that it has been proved that there were annual-stemmed species amongst the scouring rushes of America. Braun's description calls for a species with a *smooth stem*, having the leaves of the *green* sheath with *one central ridge on the lower half* and *two lateral ridges on the upper half*, the central one being depressed and flattened out in that section, the teeth being caducous and leaving a *truncate-dentate margin* to the sheath; and with *obtuse* spikes. The contrasting characters of Eaton's var. *intermedium* are a smooth or more generally *rough* stem, *ash-grey* sheaths with a *black band above and below*, caducous teeth leaving a *crenulate* margin and *apiculate* spikes. In Braun's explanatory remarks, "The sheaths, as has been stated, have generally only a narrow black limb, but some specimens have also, especially on the lower sheaths, a black girdle at base; in one specimen I have seen the whole sheath black," there is a hint that the *intermediate* plant was included in the species but no part of the description was drawn from it and it certainly was not considered as the type. The transference, therefore, of the name *laevigatum* from the smooth, annual stemmed species, for which it has so long and appropriately stood, to a rough perennial-stemmed species has been made without solid foundation of fact and should not be generally accepted. *Equisetum Kansanum* Schaffner = *E. laevigatum* A. Br. = *Hippochaete laevigata* (A. Br.) Farwell.

HIPPOCHAETE PREALTA.

Both Rafinesque's and Braun's descriptions of their respective species (*Equisetum prealtum* and *E. robustum*) were of the largest (40 or more ridges and leaves to the stem), and oldest forms (sheaths with deciduous teeth leaving a truncate margin). Engelman's *E. robustum* var. *minus* was a smaller (28–31 ridges and leaves)

form with more persistent teeth; his var. *affine* still smaller (20–25 ridges and leaves) with persistent rough teeth, finally becoming white. The variety *minus* probably is only a variation due to age and should not, for that reason, be maintained. I have seen nothing answering to the description of the variety *affine;* possibly Eaton's *E. hiemale* var. *pumilum*, with persistent, white teeth is a phase of it. Further study is necessary before final determination of its status. In *Fern Bulletin* Vol. XI, p. 111, 1903, Eaton transferred this varietal name to the American plant that had been passing under the name of *E. hyemale* and I, following Eaton's lead, retained the name under *Hippochaete*, Mem. N. Y. Bot. Gard. VI, 467, 1916. This transfer of Engelman's varietal name was without warrant. Engelman himself says the sheaths are *too short* to be *E. hyemale* and this character together with that of the *teeth being persistent finally turning white* is sufficient to prove that it is not the plant with caducous teeth and long sheaths. So far as I am able to ascertain the American plant is without a name and I propose for it the varietal name *pseudohyemalis*. The variety is: *Hippochaete prealta* (Raf.) Farwell, var. **pseudohyemalis** new name.

Equisetum hyemale Amer. authors, not Lin. 1753.

Equisetum hiemale var. *affine* (Engelm.) A. A. Eaton, Fern Bull. XI, 111, 1903, but not *E. robustum* var. *affine* Engelm. 1843.

Hippochaete prealta var. *affinis* (Engelm.) Farwell, Mem. N. Y. Bot. Gard. VI, 467, 1916, but not *E. robustum* var. *affine* Engelm. 1843.

My thanks are due to Mr. W. W. Bishop, the Librarian of the University of Michigan, and to Mr. W. N. Clute, of Joliet, Ill., for the loan of journals containing the original descriptions.

DEPARTMENT OF BOTANY, PARKE, DAVIS & CO.,
DETROIT, MICH.

Pellaea atropurpurea (L.) Link and Pellaea glabella Mett. ex Kuhn.

FREDERIC K. BUTTERS

At the time that Prof. F. L. Pickett's recent article entitled "Is *Pellaea glabella* Mett. a distinct Species?" appeared in the American Fern Journal, I had recently examined all of the specimens of *Pellaea atropurpurea* and its allies in the Gray Herbarium and the Herbarium of the New England Botanical Club in an attempt to settle the identity of some ferns of this group from western Canada, and it may be of interest to record some of the facts which were disclosed by this study.

Of the fern genera represented in the eastern United States, *Pellaea* and the closely related genus *Cheilanthes* are peculiar in reaching our area from the south by way of South America, Mexico, and the southwestern part of the United States. *Pellaea* is a typical austral genus, highly developed in temperate and tropical south Africa, the Malayan region, Australia, the Pacific Islands, and the Andes of South America, while it is entirely wanting from Europe, the Mediterranean part of Africa, and from Asia north of the Himalayas. Moreover, unlike many genera and even species of Andean ferns, it is nearly absent from the West Indies.[1] In Mexico there are about twenty species of this genus, and in our southwestern states over a dozen, while in the eastern portion of North America there are only the species here discussed and *Pellaea densa*, which occurs from California to British Columbia and western Montana,

[1] The only species which is known to occur in the West Indies is the widely distributed *P. ternifolia*, which was found by Baron Eggers in the mountains of Santo Domingo at an altitude of over 7500 ft., in a region whose flora shows much closer relationships to continental America than to other parts of the West Indies. See Urban, Ign., Zur Hochbirgs Flora von Sto. Domingo. Symbolae Antillanae **6:** 286 et seq. 1909.

and then jumps to the Gaspé Peninsula of Quebec with a single intermediate station in Grey Co., Ontario, in the vicinity of Georgian Bay.

Pellaea atropurpurea itself is reported from the Andes, though I have seen no South American material of this species. It occurs more or less throughout Mexico as is indicated by specimens from Chiapas in the extreme south, from the region of Orizaba in the east and from Sonora in the northwest. In the United States it occurs in Arizona (Conservatory Canyon, Huachuca Mts.) and extends thence eastward to the Atlantic, as is testified by abundant material from nearly all the southern states in which there are rock outcrops suitable for its growth. With a single exception, the most northerly stations represented by specimens in the Gray Herbarium are eastern Kansas, central Missouri, southern Illinois and Indiana, central and eastern Pennsylvania, western New York, northern New Jersey, and western New England.

In New York there are several specimens from the vicinity of Syracuse, one from Seneca Lake and one from Fowler in St. Lawrence Co. In New England it is abundant in western Connecticut and southwestern Massachusetts, and occurs at North Pownal, Dorset, and Burlington, Vermont. There are specimens from only two stations east of the Connecticut River, Mt. Toby, Sunderland, Massachusetts, and Lime Rock, Lincoln, Rhode Island, though I have definite information of a third locality in Bolton, Connecticut.

References to *Pellaea* in the southern counties of Ohio are probably based at least in part on this species, though I have seen no specimens of it from that state, and Prof. Pickett's station in southeastern Nebraska extends the range slightly to the northwest of the limits just outlined. The single exception noted above is that true *Pellaea atropurpurea* occurs in the southern

part of the Black Hills of South Dakota, from which locality there are specimens in the Gray Herbarium.[2]

Pellaea glabella, on the other hand, has a decidedly northern range. It is apparently more abundant and widespread in Vermont than *P. atropurpurea*. In addition to specimens which show that *P. glabella* occurs with *P. atropurpurea* near Burlington and at North Pownal, there is material of the former from Pittsford and from Willoughby Mt., Westmore. There are no specimens from southern New England in either the Gray Herbarium or that of the New England Botanical Club. There is a single specimen from York Co., Pennsylvania, one from Erie Co., Ohio, one from Owen Sound, Ontario, three from Wisconsin, two from southeastern Minnesota, one from Clinton, Iowa, seven from Missouri, chiefly from the northern half of the state, and two from eastern Kansas—both of the last mentioned being mixed collections of the two species. There are no specimens of *Pellaea glabella* from any of the southern states.

It seems probable that all references to *Pellaea atropurpurea* in Canada[3] (with the possible exception of southern Ontario), where it is reported to occur as far north as Great Bear Lake, on the Arctic Circle, refer either to *P. glabella*, or to one of its western varieties.

In Minnesota and western Wisconsin, where I am personally familiar with this fern in its living state, it occurs pretty widely distributed on cliffs and ledges of dolomitic limestone or rarely on calcareous sandstone

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[2] These specimens are: Hot Springs, 3500 ft. altitude, July 14, 1892, *P. A. Rydberg* no. 1190; False Bottom Gulch, 4000 ft. altitude, Aug. 10, 1909, *John Murdoch, Jr.* no. 3573; "Black Hills Region, Aug., 1891, *Williams.*" The occurrence of this fern in the Black Hills, so far to the northwest of its normal range, and at comparatively high altitudes, seems to be entirely parallel to the occurrence of another southern fern, *Adiantum Capillus-Veneris*, in the same region. See C. E. Bessey, Bot. Gaz. **26:** 211, and Science, New Series, **8:** 587.

[3] Such as Hooker, W. J., Flora Boreali-Americana, **2:** 264, 1940. Macoun, John, Catalogue of Canadian Plants, **5:** 260, 1890.

lying immediately below such ledges. It prefers full exposure to the sunlight, and sends its roots back deep into the joints of the rock. On prying off a piece of the ledge, I have exposed a mass of fern roots which extended back nearly a meter into the crack. It is undoubtedly this habit of deep rooting which enables the plant to live on dry and sun-baked ledges. In winter it can get almost no protection from the snow, but I have never seen it injured by the very low temperatures (—35° C and even —40° C) which are not infrequent. I have never seen *P. atropurpurea* in Minnesota or western Wisconsin. All of the cliff-brakes there are uniformly of the other species and they uniformly show the blue-green color mentioned by Pickett in his first article on these ferns.[4]

It is thus seen that *Pellaea atropurpurea* and *P. glabella* occupy almost entirely distinct ranges, which barely overlap along a line running from Vermont to Kansas. Each species is remarkably uniform throughout a very extended range and the differences between them, so well brought out by Pickett, are equally well marked whether specimens are compared which come from the extreme limits of their range, or are taken from plants growing together on the same cliff, and collected at the same time. In view of these facts, there can be, I think, no question that they are perfectly distinct species.

In regard to the differences between them, I may cite a few points not noted by Pickett in his article, and one point in which my observations are not fully in accord with his. The scales of both species are composed, except at the very base, of elongated cells, those of *P. atropurpurea* being 10–20 times as long as they are wide, those of *P. glabella* about six times as long as they are wide. The scales of *P. atropurpurea* are entire

[4] Amer. Fern Jour. 4: 97. 1914.

or very obscurely toothed, the teeth being visible only under a microscope of fairly high power. The scales of *P. glabella* usually have, on each side, a few rather prominent blunt teeth, easily seen with a good handlens.

The spore measurements given by Pickett appear to be considerably too large, at least as applied to herbarium material. My measurements are as follows: spores of *P. atropurpurea*, 50–68μ × 45–55μ; spores of *P. glabella*, 55–85μ × 45–60μ. Whether this discrepancy is due to the shrinking of the spores in herbarium material, or to an error in scale, can be determined only by examining fresh spores which are not available at the present writing. I find that, on the whole, the shape of the spores does not differ materially in the two species. Both have some spores which are plainly tetrahedral, some obscurely tetrahedral, some nearly spherical and some elliptical. In both species the spores have a wrinkled epispore, that of *P. atropurpurea* being much more coarsely wrinkled than that of *P. glabella*. In both species, in mounts of spores from herbarium material, the epispore is apt to crack off exposing the nearly smooth, pale yellow spore.

In conclusion, it is well to note that there can be no possible doubt as to the proper application of the two specific names. In both cases the original descriptions are truly diagnostic. In addition, it is to be noted that *Pteris atropurpurea* of Linnaeus was founded on one of Clayton's plants described by Gronovius and cited as growing "ad ripam fluminis Rappahannock in umbroso loco ad Juniperi radicem juxta promontorium Anglice Point-look-out dictum,"[5] a region where *P. glabella* is unknown. On the other hand, the habitat originally cited for *P. glabella* is "Kimmswick prope St. Louis. Visconsin. Columbia anglica (Lyall). Rocky Mts.,"[6] a

[5] Gronovius, J. F., Flora Virginica 197. 1739.
[6] Kuhn, Max, Reliquiae Mettenianae. Linnaea 36: 87. 1869.

range which corresponds entirely with the distribution of *P. glabella* as here recognized, taken together with a western variety of that species, while *P. atropurpurea* is not known in either Wisconsin or British Columbia.

Typical *Pellaea glabella* appears not to cross the plains, but in the Black Hills, northern Rocky Mountains and westward, there are two forms which are so closely related to this species that it seems best to consider them as varieties of it.

One of these is *P. glabella* var. *occidentalis* (E. Nelson),[7] a plant which has already given a good deal of trouble to western systematists and collectors, having been variously cited as *P. Breweri*, *P. atropurpurea*, as a new variety of the last mentioned species, and as a new species. That it is much more closely related to *P. glabella* than to *P. atropurpurea* is shown by the glabrous stipes, the form and structure of the scales, and the shape of the leaflets. In fact, in both of the last mentioned characters, it stands at one extreme of a series, and *P. atropurpurea* at the opposite extreme.

It differs from typical *P. glabella* in its smaller size, in having simpler and somewhat less coriaceous fronds with broader and less revolute fertile pinnae, in having shorter cells in the scales, and in having somewhat smaller spores, which are of a more uniformly tetrahedral shape. In size it varies from a height of about 2 cm. in the case of very depauperate individuals, to a maximum height of about 15 cm., apparently rarely exceeding 1 dm., while mature plants of typical *P. glabella* are rarely under 1 dm. high.

The fronds of the variety are almost always simply pinnate, though the lowest pinnae are rarely ternately

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[7] PELLAEA GLABELLA Mett. ex Kuhn, var. **occidentalis** (E. Nelson new comb.

Pellaea atropurpurea occidentalis E. Nelson, Fern Bull. **7**: 30. 1889.
Pellaea pumila Rydb. Mem. New York Bot. Garden, **1**: 4. 1900.
Pellaea occidentalis (E. Nelson) Rydb. loc. cit., 466. 1900.

cleft into nearly equal segments, or, still more rarely, ternately compound. In the typical form of the species the lower one or two pairs of pinnae are nearly always ternately compound, even in depauperate individuals. The fertile pinnae of the variety are ovate or elliptical, and conspicuously broader than the ovate-lanceolate fertile pinnules of the common form. They also have less revolute margins, and are of a somewhat thinner texture. In all these respects, however, eastern specimens of this species display considerable variation, and occasionally approach very close to the western variety. Thus a specimen in the Gray Herbarium from Margaretta, Erie Co., Ohio, collected August 22, 1895, by E. L. Moseley, has some fronds which are almost exactly like those ordinarily seen in the variety *occidentalis*, though the spores and the scales are those of the typical eastern form.

In *Pellaea glabella* var. *occidentalis* the cells of the scales are oblong, and even shorter than in the typical form of this species, being only 3–5 times as long as they are wide. The spores of the var. *occidentalis* differ from those of the typical form in being uniformly tetrahedral, 45 55μ in diameter.

In view of the inconstancy of some of these points of difference, and the very minute character of the others, it seems best to the author to regard this form as a geographical variety of *Pellaea glabella*. All specimens of it in the Gray Herbarium are from South Dakota and Wyoming, though it probably has a somewhat more extended range. It is to be noted, however, that many plants which have been distributed or cited under the names *P. pumila* Rydb., and *P. occidentalis* (E. Nelson) Rydb., have been incorrectly identified, and belong either to the following variety, or to *P. Breweri*.

The following is a list of the specimens of *P. glabella* var. *occidentalis* in the Gray Herbarium:

SOUTH DAKOTA: Bull Springs in the limestone district west of Custer, altitude 6000–6500 ft., July 27, 1892, *P. A. Rydberg* no. 1191 (the type collection of Rydberg's *P. pumila*, plants about 4 cm. high, lower pinnae sometimes compound).

WYOMING: on a perpendicular wall of limestone in a canyon, Laramie Hills, Albany Co., May 14, 1899, *A. & E. Nelson*, no. 6837 (this appears to be from the type locality of Nelson's *P. atropurpurea occidentalis*, though it is not the type collection; it is an exceedingly depauperate form scarcely 3 cm. tall, and corresponds entirely with the original description of Nelson's variety); on limestone rock, Tongue River Canyon, 5000 ft. altitude, September 5, 1900, *J. G. Jack* (one small plant very similar to those of the Rydberg collection, and two others, much better developed, 10–15 cm. tall).

The second western variety of *P. glabella* appears to be hitherto undescribed. It is

PELLAEA GLABELLA Mett. ex Kuhn, var. **simplex** var. nov., pumila, frondibus 1–8 cm. longis pinnatis, pinnis 5–13 simplicibus sessilibus vel brevissime petiolatis lanceolatis vel ovato-lanceolatis 5–18 mm. longis 1.5–5 mm. latis fertilibus forte revolutis; paleis rufis 0.25 mm. latis cellulis elongatis instructis; stipite basin versus paleis capillis longis instar infrequentibus pubescente.

Like the typical form of the species in its strongly coriaceous and revolute narrow leaflets, this variety differs in its very small size and apparently in having the pinnae always simple. Its scales are somewhat narrower than those of typical *P. glabella*, rather long caudate, about 0.25 mm. wide at the base, and composed of cells 10–15 times as long as they are wide. The bases of the stipes are sparsely pubescent, with long hair-like scales. The spores are nearly as in the typical form, elliptical, and 56–77μ long.

In the Gray Herbarium there are three specimens of this variety:

NEW MEXICO: Ft. Wingate 1883, *W. Mattheus.*

WASHINGTON: Klickitat Co., August 11, 1892, *W. N. Suksdorf* no. 2083.

BRITISH COLUMBIA: dry face of cliff, Carbonate Draw (upper Columbia River above Golden) altitude 5900 ft. July 14, 1904, *E. R. Heacock* in *C. H. Shaw's* Selkirk Flora no. 272 (type).

It seems highly probable that all reports of *Pellaea glabella* and of *P. atropurpurea* from western Canada are based upon the variety just discussed. Thus in the original description of *P. glabella*, the range is given, "Kimmswick prope St. Louis, Visconsin. Columbia anglica (Lyall). Rocky Mountains,"[8] and Macoun, who does not distinguish between *P. glabella* and *P. atropurpurea*, cites the following western stations for the latter species: "rare in crevices of limestone rocks on mountains near Kananaskis Station, Rocky Mountains, on the C. P. Ry., and on limestone cliffs, Clearwater River, north of Methy Portage, Lat. 57° N. W. Ter.; canyon near Buffalo Road Bridge and Cache Creek, B. C. (Macoun.) Hillsides on broken rocks, not common, Kootanie District, B. C. (Anderson.) Canada to Bear Lake and the Rocky Mountains. (Richardson, Drummond.) Mountains between Nicola and Kamloops B. C. (Lawson.) Banff, Rocky Mountains Park. (J. Smith.)"[9]

It is to be noted that the two western varieties of *P. glabella*, like the typical eastern form of this species, appear to be strictly calciphile. Limestone is mentioned as the habitat in all cases where any rock is specified, and in other cases the region mentioned is known to consist of limestones. The type specimen of the var. *simplex* comes from a region of calcareous foothills which is known to have a strongly calciphile flora.

[8] Kuhn, Max., Reliquiae Mettenianae, Linnaea **36:** 87. 1869.
[9] Macoun, John, Catalogue of Canadian Plants, part 5: 261. 1890.

Note on the range of *Pellaea Breweri* D. C. Eaton:

As there has been much confusion in the distinction of this species and *P. glabella* var. *occidentalis*, and as numerous specimens of *P. Breweri* have been distributed under the name *P. occidentalis*, it seems well to note briefly the characters of *P. Breweri* and what is known about its range.

This fern was originally described by D. C. Eaton from specimens from the Sierra Nevada Mountains of California.[10] It is clearly characterized by its extraordinarily brittle stipes and non-coriaceous fronds, and by the peculiar form of its pinnae, which are usually mitten-shaped, or two-lobed, with the anterior lobe considerably larger than the posterior. It is well illustrated in Eaton's Ferns of North America **1:** pl. 43.

The range of *P. Breweri* is from the Sierra Nevada Mountains, through the basin ranges of Nevada and Utah, to the Blue Mountains of Oregon, central Idaho, and western Wyoming. Throughout its range it is remarkably uniform in character. Unlike the varieties of *P. glabella* it seems to grow by preference on granitic rocks.

There are a large number of specimens of this fern in the Gray Herbarium. It seems unnecessary to cite those from California and Nevada, as there has been no confusion concerning it in those states. The following are the specimens from the northern and eastern portions of its range:

WYOMING: crevices in rocks, Leucite Hills, June 17, 1901, *E. D. Merrill* and *E. N. Wilcox* no. 474; same locality, June 18, 1901, *Merrill* and *Wilcox* no. 513.

IDAHO: rock crevices along the stream, Bear Canyon, Mackay, Custer Co., July 31, 1911, *A. Nelson* and *J. F. Macbride* no. 1442.

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[10] **Eaton, D. C., Proc. of the Am. Acad. A. & S. 6: 555. 1865. is a communication by Dr. Asa Gray on Characters of some New Plants of California and Nevada.**

UTAH: rock crevices, Provo, June 16, 1902, *L. N. Gooding* no. 1114; Big Cottonwood Canyon, Lake Solitude, June 30, 1905, *Rydberg* and *Carlton* no. 6529; Cottonwood Canyon, Salt Lake Co., August 14, 1905, *A. O. Garrett* no. 1610; City Creek Canyon, July 11, 1885, *F. E. Leonard;* Peterson Canyon, Wahsatch Mts., 10,000 ft. altitude, July 19, 1902, *Pammel and Blackwood* no. 3844; Alta, Wahsatch Mts., 9000 ft. altitude, July 31, 1879, *Marcus E. Jones*, no. 1118; Cottonwood Canyon, 9000 ft. altitude, July, 1869, *Sereno Watson*.

OREGON: Union Co., 1877, *N. C. Cusick*.

CAMBRIDGE, MASS.

The Male Fern in Vermont

E. J. WINSLOW

On the 19th of last July, in company with Prof. E. A. Shaw, of Norwich University, I discovered an extensive growth of Male Fern on Paine Mt. in the town of Northfield, Vt. About two weeks later, on August 6th, I returned to Northfield with Mr. C. H. Bissell and we then made a more complete survey of this station.

Paine Mt. is a level ridge 2600 ft. in elevation, extending in a north and south direction, covered at the summit with recent growth forest except a portion of the south end of the ridge and a clearing extending from this point down the western slope and rapidly widening out into extensive pastures. The rock is slatey and further down toward Northfield village are several abandoned slate quarries.

At this cleared south end among the rocks and bushes and scattered through the neighboring thickets the Male Fern is vigorous and abundant and from there it continues down the slope in a general northwesterly

direction along the edge of the forest, filling all the clearings and skirting the wood roads but avoiding both the deep shade and the open field, for a distance of a mile or more and down to about the 2000 foot level.

This is the sixth station for the Male Fern to be discovered in Vermont, all within the past eleven years. It is many times more extensive than any of the earlier stations, several hundred feet higher in elevation and carries the range about 25 miles further north into Washington County. The area covered, which must exceed 20 acres, and the apparent age of some of the plants render it highly probable that the fern has inhabited this hill from primeval time; although land at the lower end of the station has been cleared and settled for a century or more.

The Male Fern was first discovered in Vermont by Miss Nancy Darling, who, in September, 1905, found a group of about a dozen plants in the town of Hartland, in the shade of poplar and maple trees at an elevation of about 1200 feet, and quite near the road. Outcropping ledges in the vicinity are described as mica schist.

Mrs. Mabel Strong Heseltine discovered the fern in the southern part of Woodstock in August, 1906. She writes, "The station is in a partially open spot, evidently an old-time wood road and in spring a water course, shaded by buttermuts and other hard wood trees of large size. On the right and on the left there is a dense growth of maple saplings, but no ferns beyond the partially open ground." The locality is further described as crowning a pasture hill and having a northern exposure. The number of plants in this station, is given as one hundred or more, and the elevation is nearly 2000 feet.

The Bridgewater station, also discovered by Mrs. Heseltine in 1909, is largely in the highway. The plants

are plentifully scattered along both sides of the road for a number of rods. The elevation is about 1500 feet.

Miss F. E. Corne discovered the fourth station in the southern part of Barnard in 1911. According to reports by Miss Corne and Mr. Rugg, who has visited the station, there are forty or fifty plants on a southeast slope at an elevation of 1700 feet or more, and shaded by butternut trees.

These four discoveries were made in adjacent towns of Windsor County. But in October, 1913, Mr. D. L. Dutton and Mr. George Kirk found a number of plants in Brandon; thus locating it west of the Green Mountain range in Rutland County. The Brandon station has an elevation of only about 1000 feet, but it is in a cold ravine with *Dryopteris dilatata*. The rock is limestone.

This familiar wayside fern of the Old World is confined in eastern North America to the higher latitudes and apparently comes to the southern limit of its range in Vermont as a sub-alpine species, thriving best in the high pastures and thickets, and when it escapes to lower altitudes choosing cool situations. To the fact that it does occasionally migrate to lower levels, and to the more important fact that amateur botanists have within recent years come to give particular attention to ferns we owe its early discovery in Windsor County.

The discoveries above described have been made by accident or in the course of general botanizing, but when the Male Fern is hunted for with its particular habits in mind it seems fairly certain that extensive growths will be found in the higher hills of Woodstock or Bridgewater, whence the fern has spread to the known stations. Also in the mountains just east of the Brandon station, and in fact anywhere among the higher hills throughout the state, and throughout the length of the Province of Quebec, in the northern Adirondacks and

perhaps in New Hampshire and northern Maine, it should be looked for with reasonable chance of success.

It seems to have no very marked soil preference. Mr. Alexander Cowan, of Scotland, writes me regarding its habit in that country, "*L. filix-mas*—grows equally well in different soils and in shade or sun," but later he adds, "if growing in shade they prefer light overhead—that is, shaded only from the direct rays of the sun." This describes very well the habit of the fern in Vermont.

The hybrid *D. filix-mas* × *marginalis* has been found in three of the earlier Vermont stations for the Male Fern, and at Northfield it is very abundant.

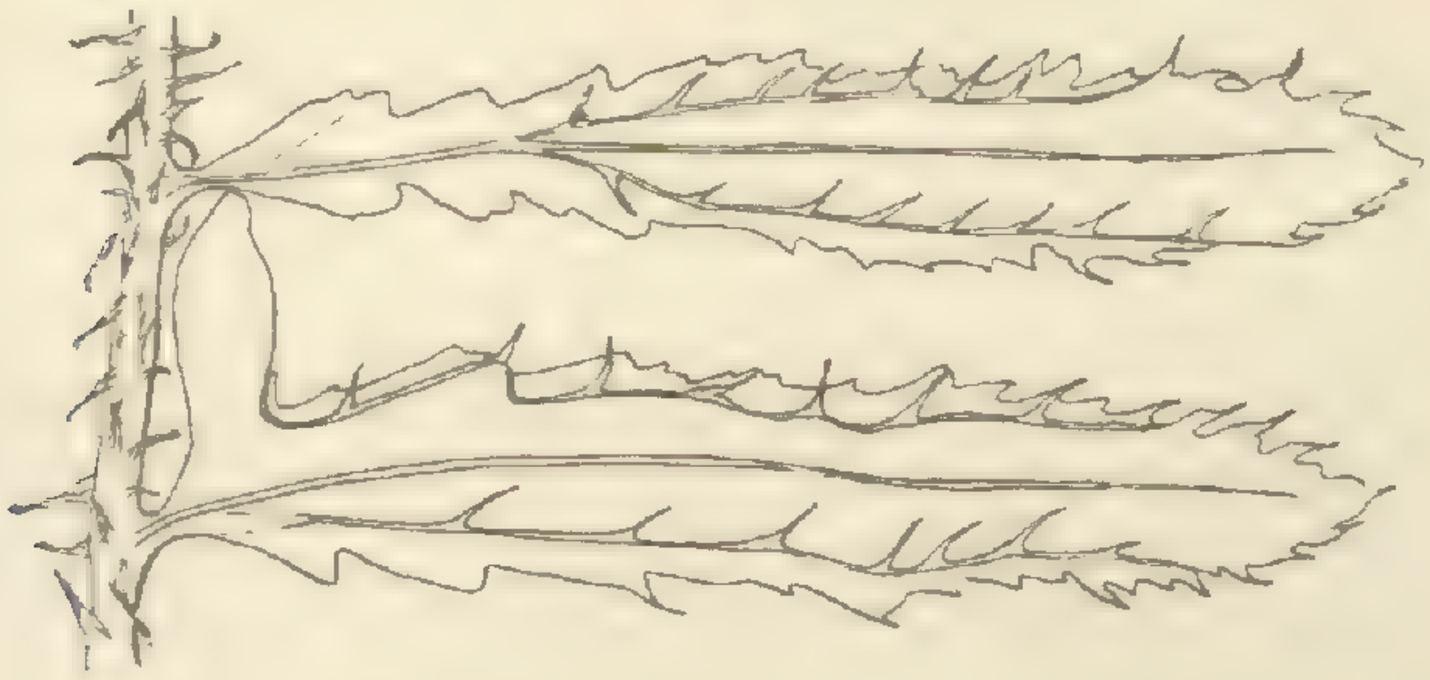
The ferns seen in Northfield and vicinity make a list of 34 species, including the *Ophioglossaceae*, and including *Woodsia ilvensis*, which Prof. Shaw has recently added to the list. Some of the more interesting are: *Botrychium angustisegmentum* and *Asplenium Trichomanes* collected in the neighboring town of Roxbury; *Ophioglossum vulgatum*, abundant and varied in some of the wet pastures; *Polystichum Braunii*, in rich woods mostly below 2000 feet; *Dryopteris Goldiana*, very abundant in some localities and sometimes accompanied by *Athyrium angustifolium*. The Polypod was seen but once, on a ledge near the river shore. The hillside pastures are very wet and springy and the Ostrich Fern grows well up to the 2000 foot line.

AUBURNDALE, MASS.

Notes and News

CONCERNING POLYSTICHUM ACROSTICHOIDES, FORMA LANCEOLATUM. The other day, in looking over a file of the *Fern Bulletin*, I came across Prof. Clute's description of this form (in Vol. 20, p. 24) and was at once reminded of a queer Christmas fern which I had found in Bloomfield, Conn., in 1908. My specimens have

pinnae with irregular teeth, largest toward the base, and with three prominent veins, as described by him, but differ in having about half the pinnae auricled on the upper side, as in the typical form, and possess one peculiar character which he does not mention. The lateral veins bear a number of broad-based bristles, 1–2 mm. long, which, in the living plant, stand up at right angles to the plane of the pinnae and are similar in size and structure to those which occur at the points of the teeth in normal fronds. The marginal teeth are mostly, but not always, without bristles. The accom-



POLYSTICHUM ACROSTICHOIDES, F. LANCEOLATUM

panying sketch, which is about life-size, shows these characters.

Dr. E. H. Eames writes me that his specimens of the original collection of forma *lanceolatum* show the same peculiarities: Prof. Clute's description should, therefore, be amended and expanded to include them.

There was only a single plant at my station. I intended to revisit it and observe it further, but, owing to absence from home during several consecutive summers, it was some years before I got there again. Then I found that the woods in the edge of which the plant had grown had been cut down and the plant itself had disappeared.

C. A. W.

GROWING FERNS FOR CUT LEAVES.—It is a truism to say that the majority of ferns require shade for successful growth. Probably less than one per cent of all fern species, the number of which is estimated at from five to ten thousand, thrive in full sun. What native species if any produce their best leaves without a particle of shade?

The illustration which represents a new adventure in the kind of fern for which it is intended, is the florists' method of providing the proper shade on a commercial scale. The photograph was taken in Orlando, Florida, on the establishment of Mr. F. W. Fletcher. The structure is what is known as a lath house and is in common use in Florida for the Boston fern and varieties as these ferns do not require greenhouse protection, at least in the warmer parts of that state. In the north lath houses are used for hardy ferns by a number of growers. In greenhouses the proper shade is provided by a summer coating of white or green paint.

The present lath house is of particular interest to the Fern Society because it is Mr. Fletcher's intention to grow ferns for cut leaves. *Polystichum adiantiforme*, often called *P. coriaceum*, will be one of the ferns tried. This fern has a thick tough leathery leaf, well deserving its common technical name, *coriaceum*. Its leaf will keep its shape and freshness, even without water, much longer than the common native species which are pulled in such quantities, *Dryopteris intermedia* and *D. marginalis*, and *Polystichum acrostichoides*. It is not quite as dainty as *D. intermedia*, but has an attractive thrice pinnate leaf with glossy segments, something on the style of the sterile part of *Botrychium silaifolium*, and if it can be developed as a commercial success, we may hope eventually for some diminution of the demand for the so-called "fancy" and "dagger" ferns from our northern woods. Other ferns will also be grown for

LATH HOUSE FOR GROWING FERNS, AT ORLANDO, FLA.
(Reprinted here by courtesy of the *Florists' Exchange*)

their leaves including the kinds which bring high prices for single leaves to which reference has been made in previous issues of the JOURNAL.

R. C. B.

Dr. Abel J. Grout has recently published a "Moss Flora of New York City and Vicinity." (Published by the author, New Dorp, N. Y., Oct., 1916.) The flora covers all the counties of New York and New Jersey contiguous to the New York City, and all of Long Island as well, and comprises one hundred and twenty-one pages with twelve fine half-tone plates. A classification and key to moss families, and under each family, keys to the genera and species with descriptions of the genera and notes on the distribution and habitat of each species commend the book as a manual for practical use.

R. C. B.

Connecticut, which long ago passed the first law to protect a fern, has made a move toward the conservation of wild ferns which have commercial value. At the last session of the legislature, a bill was introduced which required that every package or bale of "florists' greens"—which, of course, means ferns—shipped in the state must be tagged with the name of the person from whose land the greens were taken, and that the shipper must file a statement showing that he had permission to take them. In the case of carriage by automobile or other vehicle, the driver was required to have such a statement in his possession. The bill had the support of the State Forester and the State Experiment Station; it passed one house of the legislature, but unfortunately failed of passage in the other. Its reappearance at future sessions is to be hoped for.

Such a law would not interfere with legitimate business; it would not, of course, prevent any short-sighted person from exterminating the ferns on his land—that seems to be regarded as a natural right. But it would tend to stop irresponsible parties, who have not the same interest as an owner in keeping up a continuous crop, from helping themselves. It is a move in the right direction; and should be called to the attention of the authorities in all states where the fern-picking industry is carried on.

In a recent letter to *Science*, Professor Clute suggests that there ought to be some way of "distinguishing individuals who have attained eminence in their respective lines" of scientific work, regardless of whether they hold a doctor's degree or not. Probably men who do good work find the recognition of it which they value most in the respect and admiration of their colleagues, whether it be formally expressed or not; and this, we may believe, they rarely miss. Moreover, men who attain especial distinction commonly receive recognition in the shape of honorary degrees. Nevertheless, the suggestion is interesting, and it might be a very good thing if some central representative bodies, such as the sections of the American Association, could be empowered to give honorable mention to deserving work.

Prof. Breckenridge writes as follows in regard to his specimens of *Onoclea sensibilis*, forma *obtusilobata*, two of which were illustrated in a recent number of the JOURNAL:

"I picked at least a dozen . . . specimens of *obtusilobata* in Monkton, Vermont. . . . They were picked about the middle of July. When I picked them

I was impressed by the fact that they grew in among thousands of the regular type of this fern, but there was no indication of any cutting having been done for years at that particular location. I said right away that these specimens could not have been the result of damage or cutting. As far as my observation goes, these are the only specimens I have gathered that do not appear to have been formed by injury to early plants. I feel very sure these could not have been the result of such early cutting or injury."

American Fern Society

A joint meeting of American Fern Society members and members of the Appalachian Mountain Club was held in the rooms of the latter organization in the Tremont Building, Boston, during the day and evening of May 12th. Ferns were exhibited by Mr. R. A. Ware, of Boston; Miss Stella May, of Gloucester; Miss M. A. Marshall, of Still River; and Miss F. E. Corne, of Cambridge.

At the evening session the principal speakers were Prof. Geo. F. Freeman, University of Arizona, Tucson, Ariz., and Prof. Frederic K. Butters, University of Minnesota, Minneapolis, Minn. As Mr. Rugg was down from Dartmouth College, at least four states were represented. Prof. Freeman gave a very entertaining as well as instructive talk on "Some Natural Features of the State of Arizona." Prof. Butters spoke on the Lady Fern and illustrated by numerous specimens the various forms that are grouped under this common name. Prof. Butters has made a careful study of this group as it is represented in the different parts of North America, and has reached several conclusions which are new and interesting. E. J. Winslow exhibited speci-

mens and spoke briefly on some new species and varieties recently published in *Rhodora*.

The meeting was arranged by Mr. Ware, to whom thanks are due for a meeting that was exceedingly interesting and profitable in spite of the fact that the more popular parade in honor of General Joffre made travel through the streets of Boston somewhat difficult.

E. J. WINSLOW.

Mrs. Ella J. C. Hurd died in April at Daytona, Fla., aged 74 years. It had been her habit to divide the year among Florida, Washington, D. C., Huntington, L. I., and Hartland, Vt. Natural history was among her dearest interests and she did much to encourage the study of it by others. She is said to have started fern study at Hartland (where, it will be remembered, the first Vermont station for the male fern was discovered), by her example and the loan of books; and she made valuable gifts of books and specimens to the local nature club. She bequeathed her old house at Huntington, L. I., where she was born, to the local historical society. One room in it is to be used as a natural history museum, and the nucleus of its collections will be some 200 specimens of butterflies which she herself had collected and in the mounting of which she did exquisite work.

Wanted to exchange *Blechnum brasiliense*, *Cyrtomium falcatum*, *Pteris Wimsettii*, *Dryopteris mollis*, *Trichomanes Petersii*, *Tr. radicans*, *Asplenium Bradleyi*, *A. pinnatifidum*, *Adiantum Capillus-Veneris*, and other ferns and orchids from the Southeastern United States for European, African, or Japanese ferns—herbarium specimens. Also have old volumes of *Bird Lore* to sell or exchange for fern literature.—*E. W. Graves, Long Island, Ala.*

New members:

Bates, Miss Ethel, South Royalston, Mass.
Butters, Prof. Frederic K., University of Minnesota, Minneapolis, Minn.
Child, W. A., 389 Hess St., S. Hamilton, Ontario.
Clarkson, E. H., 41 Tyng St., Newburyport, Mass.
Lewis, Rev. Charles Smith, St. Mary's Rectory, Burlington, N.J.
McColl, W. R., Owen Sound, Ontario.
Scott, Mrs. Willard, 489 Washington St., Brookline, Mass.

Changes of address:

Greene, F. C., 30 North Yorktown St., Tulsa, Okla.
Wertsner, Clayton S., 11th and Race Sts., Philadelphia, Pa.

Through an exchange, the Society has just acquired a nearly complete set of the *Philippine Journal of Science*, Section C, Botany. This set contains a number of articles on tropical ferns by Dr. E. B. Copeland, and—with certain restrictions, since it is not yet bound—is available for lending to members. The missing numbers are: Vol. 2, no. 6; Vol. 6, no. 1; and Vol. 7, nos. 1–3. The Secretary will be obliged to any one who can tell him where these numbers can be procured.

President Palmer has appointed the following committee to nominate officers for 1918: Chairman, Mr. C. H. Bissell, Southington, Conn., Mr. Robert A. Ware and Dr. Philip Dowell. All concerned are reminded that independent nominations made by any three members in good standing and sent to the Chairman of the Nominating Committee before August 20th, will be placed on the official ballot.

American Fern Journal

Vol. 7 OCTOBER–DECEMBER, 1917 No. 4

Fresh Pleasures from old Fields

H. E. RANSIER

A man past 60, country raised, went to the Adirondacks for a few weeks recently for his health. While killing time on his balsam bed, he picked the leaves of plants within his reach. Something about one kind which abounded, excited his curiosity and he asked the guide the name of the plant. The guide did not know, neither did any one he inquired of, so he brought home a few of the leaves and put it up to me, saying the leaves when rubbed to a powder in his hands, would produce violent sneezing. They were only common buttercup leaves, *Ranunculus acris*. It appears that none were in flower when he saw them. This is an extreme case, but illustrates how we all are apt to overlook the common things that surround us, be it plant, insect or animal life. The purpose of this article is to help its readers to become more intimately acquainted with the ferns that abound in their own section, and to show how they may get fresh pleasures from old fields, for what is true of the hart's tongue fern, may be equally so of some more common kind that may have not been noticed closely heretofore.

To be located in a section rich in ferns and yet be able to go afield but a couple of half days in a season has been my lot for many years. Under such circumstances there has been a tendency to follow well known and familiar paths. This in itself tends to a monotonous

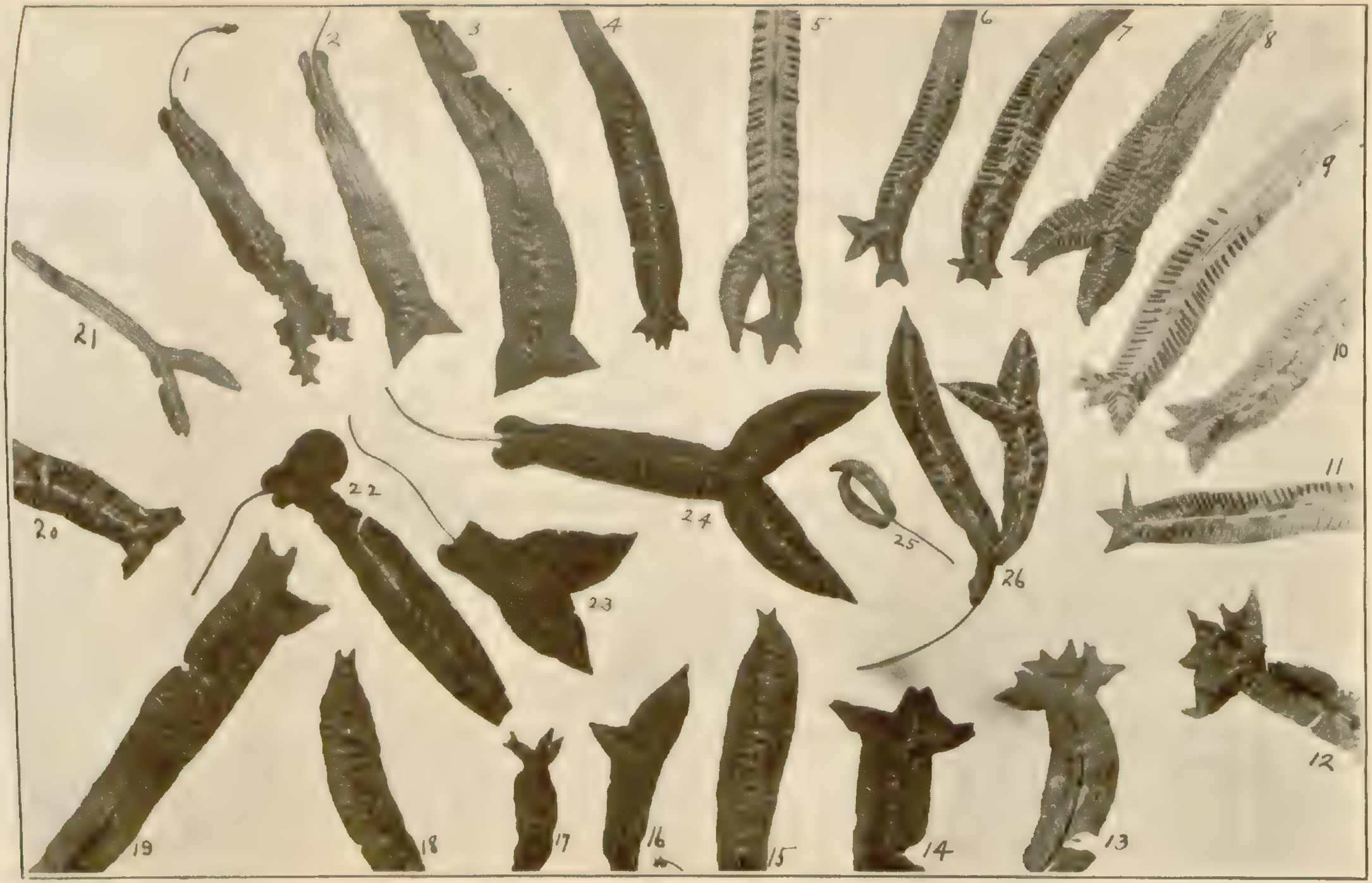
[No. 3 of the JOURNAL (7: 61–98, Plate 4) was issued Aug. 9, 1917.]

experience, but in my case, I have been saved from it by a habit of looking for unusual forms, a habit formed before I became chained so closely to business and now I feel spurred on to search for each season's fresh prizes very closely. A great many members of the Fern Society would be happy to spend a half day with the hart's tongues, but unless attention had been drawn to it, would only see the normal forms, as I did myself for a long time. After having become familiar with its limited range, there was but little to keep up one's interest in it, aside from collecting specimens, piloting others, or occasionally taking a plant for potting.

But *now*, I never fail to visit every station and scrutinize every frond possible. How great the pleasure when one stumbles upon a new form, and they rarely are twice alike! How excited one is to find fronds having three, four, and even up to eight tips!

On a recent trip, the day was ideal. A forty-five minute trolley ride, then a tramp through daisies, buttercups, alfalfa, mouse-ear, hawkweed and strawberries. Giant Trilliums filled the woods, green and scarlet fungi fringed the woodland; wintergreens abounded and bobolinks, meadow larks, blue jays and catbirds with a host of others were met with along the way. A spot where wild strawberries crowded out everything else stopped me. It was fairly scarlet with ripe clusters and I hailed a couple of passing hunters to share the feast with me. Soon the Scolopendriums have been reached; the air is damp and dank. Mosquitoes are there to welcome me. I fancied the first one I met hailed his fellows with "Hey, boys! Here he comes and it's his last trip this year! Go for him!" Perhaps my skin is tender. Perhaps they do not fear me on account of my size. Possibly they are simply hungry. Any way, they gave me every attention while I remained.

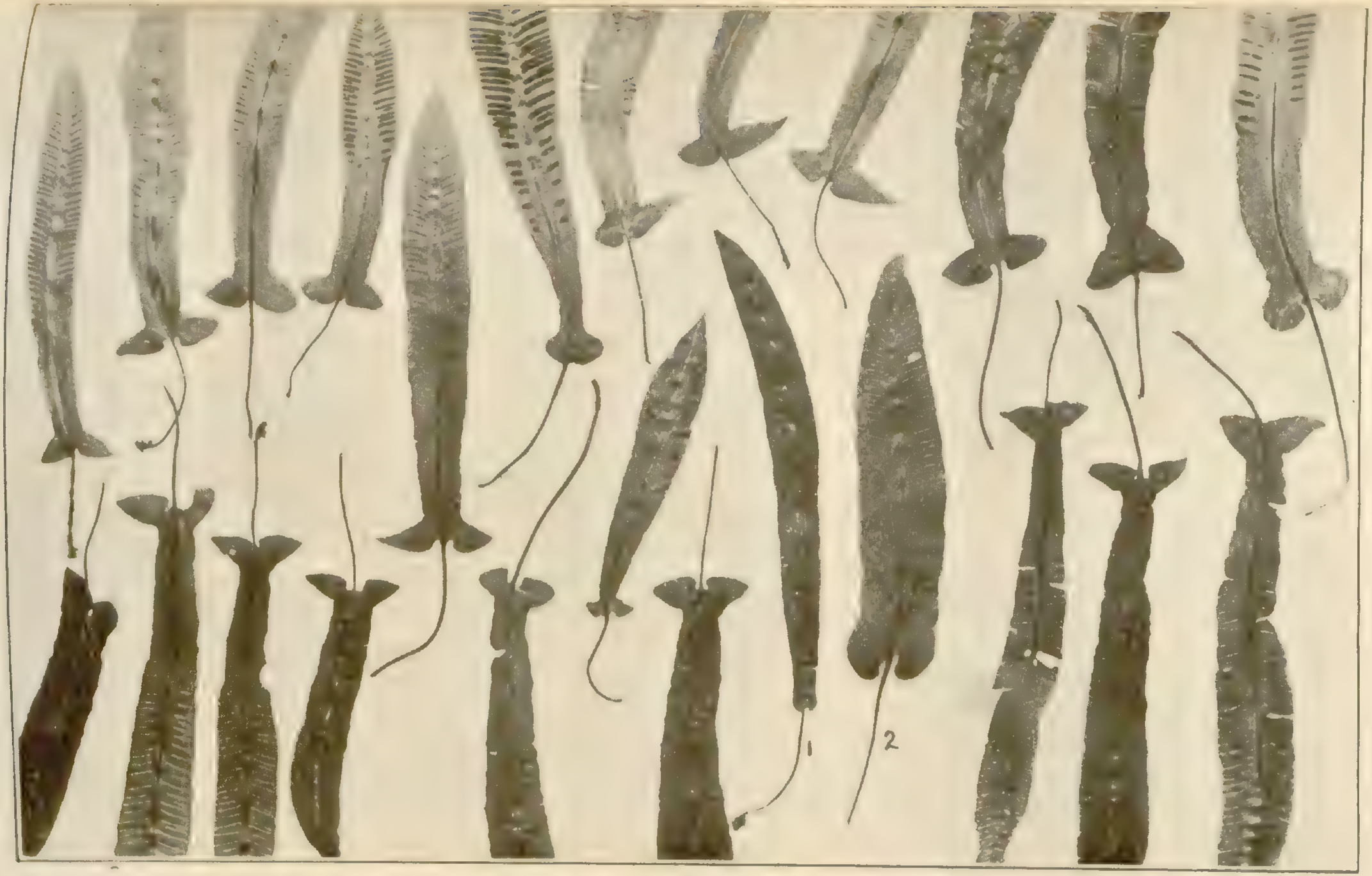
The first 20 plants inspected, yielded 6 forked forms. Within a 50-foot circle, 23 forked fronds were found.



FORKING TIPS OF THE HART'S-TONGUE FERN
(From a photograph by H. E. Ransier)

mostly short forkings. During the afternoon over 50 abnormal tips were discovered, about 30 of them slightly forked, 10 were with forks an inch or so long, 4 had divisions 1½ inch deep, 4 about two inches long, 2 about three inches, 2 about four inches, and one was forked three times.

The finest specimen collected in 1917 bears five distinct tips, the central one about the size and position of a normal tip, with a double-tipped lobe on either side below it, making a cross-shaped ending of the frond, measuring 2¼ inches across, about ¾ of an inch below the centre tip. I am satisfied if I find half a dozen well-forked specimens on a single trip, such as those numbered 6, 8, 11, 23, 24 and 21 on plate 5. A great many similar to numbers 2, 15, 16 and 10 may be picked up almost any time. Specimens like 12, 13 and 26 are rarely found. No. 13 was found some years ago and unfortunately only the freak tip was preserved, as I was not able to carry the whole frond, which was an unusually fine one. The question arises, "Why do these fronds fork?" I am as much at a loss to explain today as I was when I first began collecting. Some have thought that it was because the fern possessed a surplus of vitality and food which favored it, but puny little starved fronds are found forking too and this seems to disprove the theory, as specimen No. 25 would indicate, which is about as completely forked as one can desire. It is not an uncommon thing to find more than one forked frond on a single root, and sometimes several are found together. Similar ones to Nos. 24 and 26 are frequently found under the others, as the stem seems unequal to the task of supporting a matured well-forked fertile frond. On my last trip I searched for forked fronds of the previous year's growth, as the old ones were still green and nearly perfect, though prostrate and covered with decaying leaves, and in no case did it



Forms of Basal Lobes in the Hart's-tongue Fern
(From a photograph by H. E. Ransier)

appear that forking fronds had grown on the same plant two years in succession. Of course, such may have been collected the previous season, but it seemed strange that not one specimen should have been found to have forked in 1916 as well as in 1917.

It is more common to find a number of fronds having abnormal lobes at the base on a single plant, than to find several with abnormal tips on one specimen. No record has been kept of the place and date of collection of any of those used in illustrating this article, but it is safe to say that all were collected within six miles of Manlius and most of them within 3 miles. A great many better ones have been distributed to members than some used for the cuts. By oversight the plate showing tips does not include a normal one for comparison with the others, but the other plate happens to show several of the normal tips among the abnormal bases. It is well to notice that Figures 1 and 2 on plate 6 are of normal base lobes. Also that this plate happens to show fronds in various stages of spore development.

MANLIUS, N. Y.

Notes on American Ferns—XI[1]

WILLIAM R. MAXON

CAMPTOSORUS FROM OKLAHOMA.—The walking fern, *Camptosorus rhizophyllus*, is known from Kansas, but seems not to have been recorded from the territory immediately southward. Excellent Oklahoma specimens have recently been distributed, however, by Prof. G. W. Stevens, being his Nos. 2003 and 2005, collected near Pawhuska, Osage County, in August, 1913.

THE ALTITUDINAL RANGE OF ASPLENIUM MONTANUM.—In his paper of nearly twenty-five years ago[2] recording

[1] Published by permission of the Secretary of the Smithsonian Institution.

[2] Bull. Torrey Club 20: 455–467. 1893.

the extremes of altitude observed for the ferns of the Appalachian Mountain system, Dr. John K. Small gives the maximum elevation for *Asplenium montanum* as 4500 feet, on Grandfather Mountain, North Carolina (*Small & Heller*). This is considerably exceeded by specimens collected in May, 1917, at the very summit of Mount Pisgah, North Carolina, altitude 5749 feet, by Mr. Frank Crayton and the writer. The species has been collected also at about 5000 feet in the vicinity of Eagle's Nest, near Waynesville, North Carolina (*Standley* 5398) and at about 4500 feet on the upper slopes of Rabun Bald, Rabun County, Georgia (*House* 2257), and there are several other records of above 4000 feet. It descends to about 100 feet altitude at the Great Falls of the Potomac River, just above Washington, D. C.

NOTHOLAENA CRETACEA AN AGGREGATE.—In some recent notes on *Notholaena*[3] the writer has undertaken to show that the Mexican and United States specimens passing commonly as *N. cretacea* Liebm. actually represent three species. As this publication is not generally available to Fern Society members it seems desirable to indicate briefly the conclusions reached. The three species recognized are: *N. cretacea* Liebm., known only from a few localities in the southerly state of Puebla; *N. neglecta* Maxon, a new species known from the states of Coahuila and Chihuahua, and from two collections in the Huachuca and Mule Mountains of extreme southeastern Arizona; *N. californica* D. C. Eaton, abundant in southern California and known also from a single locality in adjacent western Arizona and from several stations in Lower California. The distinguishing characters of the three species are mentioned in some detail.

DICRANOPTERIS FLEXUOSA AGAIN COLLECTED IN ALABAMA.—In the course of zoological collecting in Alabama

[3] Contr. U. S. Nat. Herb. 17: 601–604. 1916.

late in 1916 Mr. Arthur H. Howell, of the Bureau of Biological Survey, Department of Agriculture, had an opportunity to visit the locality for *Dicranopteris flexuosa* near Delchamps Station, a few miles from Mobile, recorded by the writer several years ago.[4] That the fern is actually well established at this place is clear from Mr. Howell's observations. He writes that it was found "in exactly the situation described, in a round hole in the side of a shallow railroad cut," and adds. "The big flood of last July may have enlarged the original fissure, but apparently it did not injure the plants. I found only a single clump, comprising perhaps 40 or 50 stalks, closely bunched, in which were mixed a number of dead fronds." Mr. Howell collected several specimens, of which a part have been added to the National Herbarium.

EQUISETUM PALUSTRE IN OREGON.—This species seems to be well known as occurring in the State of Washington, but not to have been reported from the region southward. A specimen received at the National Herbarium for identification recently bears the following data: Jarboe Creek bottom, Wenaha National Forest, Oregon, altitude 4000 ft., July 30, 1916, *William E. Lawrence* 95.

WASHINGTON, D. C.

A new Notholaena from the Southwest[1]

WILLIAM R. MAXON

In the second of a series of five articles published in the American Naturalist for 1875, giving an account of his botanical investigations in southern Utah during the preceding year, Dr. C. C. Parry records, in the follow-

[4] Amer. Fern Journ. 4: 15. 1914.

[1] Published by permission of the Secretary of the Smithsonian Institution.

ing words, his discovery of a fern new to the United States: "At our nooning place, having reached an elevation of not less than one thousand feet above the valley of the Virgen, a deep gorge in the limestone rocks afforded a scant supply of water. In the abrupt face of these perpendicular rocks, a delicate fern was noticed, which Prof. Eaton has determined to be identical with the *Notholaena tenera* Gillies, from the South American Andes, not before found in North America. Owing to the shortness of our stay and the difficulty of securing specimens from the inaccessible positions in which they grew, only scanty collections were made, but the locality is so readily identified that some future botanist will be able to supply the demand for this interesting addition to North American Filices."[2] In the concluding paper (p. 351) the locality data are stated more definitely, as follows: "Crevices of perpendicular limestone rocks in a deep ravine near the base of Beaver-dam Mountains, twelve miles southwest of St. George," with brief comments by Eaton, these comparing the Utah plants with South American material. *Notholaena tenera* was originally described from Argentine specimens,[3] and had been known previously only from the Andes of South America.

In "Ferns of the Southwest"[4] Eaton published a description of "*Notholaena tenera*," basing it chiefly upon southern Utah plants, additional specimens of which were said to have been collected by Dr. Edward Palmer in 1877. A short time later, in the Ferns of North America,[5] Eaton figured the Utah plants as *N. tenera*; and though expressing some doubt as to their proper

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[2] Amer. Nat. **9**: 140.

[3] Curtis's Bot. Mag. **5**: *pl. 3055*. 1831. Also figured by Kunze (Farrnkr. **1**: *pl. 22, fig. 2*) and by Hooker & Bauer (Gen. Fil. *pl. 76A.*).

[4] In Report U. S. Geographical Survey West of One Hundredth Meridian, **6**: 309. 1879.

[5] **1**: 335–338, *pl. 43, figs. 9–13*.

reference to this South American species, and citing Baker's opinion to the contrary, he nevertheless drew a description of *N. tenera* to cover both forms. The Parry and Palmer plants have not been seen by the writer. Agreeing with the figures and descriptive notes, however, are several other specimens now at hand from southern Utah and southern California, and these indicate an undescribed species wholly distinct from *N. tenera*. It may be known as below, the name being given in honor of Mr. Marcus E. Jones, author of "Ferns of the West" and for many years a keen and interested collector of this group.

Notholaena Jonesii Maxon, sp. nov. —Plants tufted, the rhizome short, oblique, conspicuously chaffy, the scales linear, very long-attenuate, thin, bright brown; fronds 3–10 cm. long, spreading, the stipes curved, closely fasciculate, reddish brown, sublustrous; blades mostly twice as long as the stipes, oblong-ovate to narrowly triangular, bipinnate; pinnae few, opposite to alternate, with one or two pairs of distant, entire to crenately lobed, roundish or subcordate pinnules and a similar, but larger, terminal segment; pinnules mostly short-stalked, the stalks flat and greenish brown; leaf-tissue apparently fleshy, herbaceous, glabrous, somewhat glaucous, not at all pulverulent; sporangia borne toward the end of the once or twice forked veins in a broad submarginal band, dark, nearly globose.

Type in the U. S. National Herbarium, No. 359447, collected in Panamint Canyon, Inyo County, California, altitude 1200 meters, May 4, 1897, by Marcus E. Jones. Additional specimens are: Fifteen miles west of St. George, Utah, *Jones* 5004d; crevices of dry limestone cliffs, mountains back of Cushenberry Spring, San Bernardino County, California, May, 1882, *S. B. & W. F. Parish* 1242; and a second Parish specimen, also collected in May, 1882, marked "Cushenberry, n. side S.

Ber. Mt." Of the several collections the specimen selected as the type is by far the largest and best preserved.

Of *Notholaena tenera* specimens are in the National Herbarium from Argentina (Cordoba, *Kuntze*), Bolivia (*Rusby* 326, 327), and Peru (*Wilkes Exped.* 4, *Safford* 992, *Rose* 19471), all from the high mountains, up to at least 3000 meters. From these *N. Jonesii* differs constantly in its much lower stature and its depressed-spreading habit, in its very much more slender, long-attenuate rhizome scales, in its reddish brown (not purplish black) stipe and rachises, in having the blades bipinnate with only the major pinnules of the larger pinnae deeply lobed or divided (as opposed to the subtripinnate blades of *N. tenera*), and in the orbicular to subcordate (not elliptical to oval) form of its pinnules, these attached to the secondary rachises by short flattish, greenish brown stalks in contrast to the slender, terete, purplish black stalks of *N. tenera*. The dark wiry rachises throughout give *N. tenera* the appearance of a much more slender and delicate plant than *N. Jonesii*, despite its far greater size.

Apparently *N. Jonesii* is extremely rare and not often collected. It seems to be a pronounced xerophyte and will probably not be found far from the area within which it is now known. As *N. tenera*, it has been reported from Arizona. The California localities, including at least two not mentioned above, have been discussed interestingly by Mr. S. B. Parish.[6]

Washington, D. C.

[6] Erythea **1**: 153–154. 1893. See also, Fern Bull. **12**: 6. 1904.

Observations on the habitat of certain ferns

EDGAR T. WHERRY

In the course of geological field-work in the Appalachian Mountains the writer has often found ferns which are usually regarded as characteristic of calcareous rocks growing on rocks such as granite, sandstone, and schist, which are as a rule very low in lime. In order to ascertain whether the presence or absence of lime in a rock has anything to do with the growth of the ferns upon it, a series of chemical analyses has been made with the results herein described.[1]

For the first subject the walking fern, *Camptosorus rhizophyllus*, was selected, and samples of the rocks and the soils on which it was growing were collected at twenty stations in Pennsylvania, Maryland, Virginia and West Virginia,[2] ten different rocks being represented.[3] The percentage of lime in each rock was first determined, and, as had been expected, was found to vary widely; one pure limestone proved to contain over 53% of lime, but there was less than 5% in many of the rocks, and mere traces in several of them. The fern is, therefore, by no means limited to calcareous *rocks*; it must get lime from some source, however, for analysis of the ash obtained by burning its leaves showed the presence of 30% or more of this constituent. So examination of the *soil* in which its roots were imbedded seemed desirable.

[1] The detailed results of the analyses have been published in Journ. Wash. Acad. Sci., Vol. 6, 1916, pages 672–679.

[2] These stations were located with the kind aid of the following local botanists of the several regions, to whom the writer herewith expresses his thanks: Mr. Harold W. Pretz, of Allentown, Pa.; Prof. Glenn V. Brown and Prof. N. F. Davis, of Bucknell University, Lewisburg, Pa.; and Dr. T. C. Stotler and Prof. H. T. McDonald, of Harper's Ferry, West Virginia.

[3] These comprised limestone, dolomite-limestone, limestone-pebble conglomerate, argillaceous limestone, mica-schist, granite, granitic gneiss, shale, sandstone, and quartzite; there were also two occurrences on hemlock trees.

The total amount of lime in the several samples of soil was found to vary from 1.2 to 10.5%, the average being 4.4%. When it is considered that the field soils of the same regions contain on the average only 0.8% of lime the highly calcareous character of the soils supporting the growth of this fern is evident. Determination of the amounts of water-soluble lime gave a similar result, the fern soils yielding 0.08%, the field soils only 0.01%.

These data clearly indicate that *Camptosorus* is a lime-loving plant; so the problem resolves itself into accounting for the presence of a soil containing 4 or 5% of total lime in the crevices of a rock which may carry only traces of this substance. The explanation is not difficult to find;[4] the soil supporting the growth of the fern is in most cases a black, powdery material consisting chiefly of bits of leaves, stems, etc., in various stages of decay, and containing only minor amounts of rock fragments derived from the adjacent ledges. Such vegetable matter contains even in its fresh state 2 or 3% of lime; and upon its decomposition organic substances are volatilized, resulting in a gradual concentration of this lime. Some of this substance may be carried away by rain water,[5] but enough remains to render the soil calcareous, and to satisfy the lime-requirement of the fern.

In addition to Camptosorus several other rock ferns have been studied from the same viewpoint, with similar results. They comprise: *Asplenium ebenoides*, *A. montanum*, *A. pinnatifidum*, *A. ruta-muraria*, *A. trichomanes*; *Cheilanthes lanosa*, and *Pellaea atropurpurea*. In

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[4] It has been fully treated by Mr. Frederick V. Coville, in "The formation of leafmold," **Journ. Wash. Acad. Sci., Vol. 3, 1913, p. 77**; Annual Rept. Smithsonian Inst., 1913, p. 333.

[5] The soils over limestone are in fact often poorer in lime than those over other rocks, owing to the comparatively great solubility of limestone in rain **water.**

all cases the soils in which the roots were imbedded proved to be highly calcareous, even though the adjoining rocks were not.

In view of the above results it seems obvious that in the study of the habitats of plants, such as these ferns, the mere superficial recording of the kind of rock is inadequate, and may lead to erroneous conclusions. The nature of the soil upon the rock is the important factor, and this should always be examined to find out whether, instead of being derived from the rock, it may not consist essentially of decayed vegetable matter. In the latter case, lime-loving plants may be enabled to thrive even though the underlying rock is wholly non-calcareous.

U. S. NATIONAL MUSEUM,[6] WASHINGTON, D. C.

Cheilanthes lanosa and Isoetes in Indiana

CHARLES C. DEAM

The only record for *Cheilanthes lanosa* (Michx.) Watt for Indiana is contained in a list of the "Plants of the Lower Wabash Valley" by Dr. J. Schneck. This list was published by the Indiana Geological Survey in 1876. The area included in the title "Lower Wabash Valley" is that below the confluence of White River of Indiana. The Indiana territory included was parts of Gibson and Posey Counties. The habitat of *Cheilanthes lanosa* is given as rocky ledges. In Gibson and Posey Counties there are no rocky ledges, except a few low sand-stone ledges on the "Gordon Hills" in Gibson County, and a few low limestone ledges along the Wabash River below New Harmony. The writer has searched all of these and has failed to find the fern referred to, although the pressure of forty years of civil-

[6] Since this paper was written transferred to the Bureau of Chemistry

ization since the report was made may have exterminated it. Further, the writer purchased all of the Indiana specimens contained in the Schneck herbarium, and this fern was not in the lot. From a consideration of the preceding facts, it is believed that Schneck did not find his specimen in Indiana, but in one of the adjoining counties of Illinois, which has rocky ledges.

On June 29, 1915, the writer found this species in Perry County about six miles east of Cannelton on the top of the high rocky bluff of the Ohio River. It was noted but once, and was located on the top and near the edge of a high perpendicular ledge of rock. The specimens formed a mat over an area about two feet long and a foot and a half wide.

On July 10, 1915, I again found this species in Martin County in the crevices of a rocky bluff along White River about five miles north of Shoals. The rocky ledges at this place are locally known as the McBride bluffs. Here it is sparingly found in isolated tufts. It is of interest to note that *Polypodium polypodioides* (L.) Hitchc. covered large areas of the perpendicular ledges at this place. This is the most northern location for the latter species in Indiana.

The genus *Isoetes* was not known in Indiana until I found *Isoetes foveolata* A. A. Eaton in Harrison County, June 25, 1915. This species was found in abundance in a low woods four miles south and one mile east of Palmyra. It formed a mass about four feet wide and twenty-five feet long. It was located in a long ago abandoned logging road through a thick woods of tall trees. The trees nearest were *Liquidambar*, *Quercus palustris*, *Nyssa sylvatica* and *Acer rubrum*. The only herbaceous plants nearby were *Ludwigia palustris* and *Samolus floribunda*.

An additional species of *Isoetes* was found in Crawford County on Oct. 12, 1916. It was located in a small

pond in a field near the north side of an east and west road, and about one mile east of Pilot Knob hill. The pond was dry on this date, but the species is submerged in this pond the greater part of the year. This species proved to be *Isoetes Braunii* Durieu. Both species of *Isoetes* were determined by Prof. L. S. Hopkins. Specimens of the species of ferns and quillworts mentioned in this paper have been distributed among the larger herbaria of the United States.

BLUFFTON, INDIANA.

Experiences with a Fern Garden—II

C. L. GRUBER

In August, 1911, a magnificent specimen of the common brake, four feet high, was brought home and planted in the yard along a wire-netting fence. On account of its weedlike propensities I did not trust it in the fern bed. In 1912 it sent up eight fronds, but none half so high as the one I planted; but in 1913, when more than thirty-five fronds were produced, a number were nearly as tall as the original one. I set a barrier of boards, ten inches wide, into the ground to confine the ferns within a given space, but some rootstocks dived beneath the boards and sent up fronds six inches to four feet away, several coming up out of a bank eighteen inches above the level of the area in which I had attempted to inclose them. The bracken usually begins to grow during the last week in April. Practically all the fronds are fertile and the brown sporangia ripen from the middle of June till into September.

From a station thirty miles away I brought three plants of the purple-stemmed cliff brake and set them in my fern garden in August, 1911. I planted one of them in the open ordinary soil, another at the base of

the rock pile, and the third among some flat pieces of flaky limestone. The third one alone seemed to be planted in soil adapted to its needs. The plant set in the ordinary soil, away from stones, a vigorous specimen, died in 1912, the one at the base of the rock pile failed to appear in 1913, but the other, set among limestones, grew finely till 1916, when, after producing a half-dozen fine fronds, it began to decline and was dead by the middle of summer. The first fronds of spring appeared from April 25 to May 10 and the dark brown to shiny black sporangia ripened during the second half of June. The first fronds are practically all fertile, but those appearing late in June or early in July are sterile or only partly fertile. On upright fronds the pinnae usually stand in a horizontal position.

In June, 1911, I selected two obtuse woodsias from among dozens growing on a rocky bank, for my fern garden and planted them in the ordinary soil of the garden. They thrived wonderfully in their new home, producing more and finer fronds than in the wild state. On their native rocks, exposed to the sun for at least half of the day, the ferns were rather slender, more or less decumbent, and yellow-green, but on my fern bed most of them were strong, erect, and bluish green, and one peculiarity was that they were much more hairy than their former companions growing on the ledges. The woodsias are among the first to appear in spring, sometimes appearing as early as March 25 and never delaying their coming beyond the middle of April. Practically all the fronds are fertile and the brown sporangia continue to ripen on successive fronds from about the 5th of June till into September. I have good evidence that some ferns die of old age. One of the obtuse woodsias, a strong plant, multiplied and spread outward so rapidly that its root base measured over seven inches in diameter by the close of 1913. In the

spring of 1914 the central portion was dead, but the new growth formed a circle of fronds around it. In 1915 only a few weak fronds appeared. By transplanting some of the young growth of 1914, I soon had a new clump of thrifty woodsias. In the case of several species of ferns, this method of transplanting appears to be the best plan for keeping the fern garden stocked with typical specimens. In 1914 I noticed a tiny fern outside the fern bed, in a slightly moss-grown place. This proved later to be a seedling woodsia, the first fern to grow from the spores of my garden, and in 1916 I gave it a place in the bed where it promptly sent up typical woodsia fronds.

I have had difficulty in growing rattlesnake ferns. I planted one in 1911 and two in 1912, but all failed to appear the second year after they were planted. In 1914 I again planted two of these ferns and they were still growing in 1916. The new growth appeared in spring from April 26 to May 5; but when they fruited at all they fruited so poorly that no reliable record could be kept of the ripening of their yellow sporangia.

If their rights are properly respected, the grape ferns are easily cultivated. During 1911 and 1912 I planted five grape ferns; but when I dug up the fern bed in 1913 I evidently disturbed their roots unduly, an unfortunate occurrence which all except one resented by dying. The one exception lay dormant during 1914 and again appeared in 1915. In September, 1914, I planted two grape ferns of the *obliquum* type, two of the *dissectum* type, and one intermediate between them. I now have five growing grape ferns, mostly thrifty plants. In 1916, four of them fruited and one, the *dissectum* of 1912, produced two sterile fronds in addition to a fine fertile frond. The bronzed sterile fronds of 1915 remained as late as the first or second week in August, 1916, and at the beginning of August they were still

living but withering and becoming blotched with black. The young fronds appeared, both sterile and fertile at the same time, on dates varying from June 20 to July 10 and rather regularly distributed between them, except one very late one which appeared on July 22; and the yellow sporangia ripen from September 15 to September 25.

No ferns respond more readily to cultivation than the Christmas ferns. In August, 1912, I planted two of these ferns of the common type, one of the *crispum* form, and one of the *incisum* form, and all grow satisfactorily. The new fronds commonly appear in spring from April 12 to April 24. Most of the first fronds are fertile and the orange-brown spore cases ripen commonly during the first week in June although on some fronds they do not ripen till the middle of June. The spores of the variety *crispum* seem to come to maturity a few days earlier, my record for three successive years giving the date as May 30. After the spores are shed the persistent indusium frequently has the shape of an inverted square pyramid. Sterile fronds appear from the middle of June to the beginning of August.

Two dwarf spleenworts were transferred to my fern garden in July, 1911. One, planted in ordinary soil away from stones, was dead in the spring of 1914; the other, set in a crevice of the rock pile, has developed into a fine specimen and sends up an increasing number of fronds each year. In 1913 a few fronds began growing on April 12, but the usual time for them to appear is the first week in May. The rich brown sporangia ripen about the third week in June. The first fronds are practically all fertile and fruiting fronds continue to appear as late as July, the sterile fronds, usually not numerous, appearing late in June and in July.

The ebony spleenwort has so far disappointed me. From 1911 to 1914 I planted seven of these pretty

ferns and by 1916 every one of them was dead. During the two or three years of their life they produced a few short fertile fronds and a few sterile fronds. The data concerning their growth were consequently unreliable; but those concerning the dwarf spleenwort seem to fit the ebony spleenwort exactly.

Cultivated or wild, the lady fern is a vigorous grower; and it seems to me as if the plant in cultivation increases the spread of its rootstocks more rapidly and produces more numerous fronds than it does when growing wild. In May, 1911, I planted two of these ferns in my fern bed, one of the regular type and one of the red-stemmed variety; and in August, 1912, I planted a form with broader and more leafy fronds. All are growing vigorously, the red-stemmed form, especially, having produced a dense mass of rootstocks bulging several inches above the surface. The extreme dates when these ferns began to grow in spring are April 17 and May 1, but the usual time for their appearance is April 24. I also planted one red-stemmed lady fern in ordinary soil along a fence and it thrives as well as those on the bed. The first fronds are sterile or only partly fertile, the fertile fronds appearing from two to four weeks later. The leafy-fronded form seems to produce a smaller percentage of fertile fronds than the others. In 1914 a rather severe drought prevailed during May and the beginning of June, but toward the middle of June wet weather set in and most of the ferns responded to the welcome change by producing new fronds. This was especially noticeable in the lady ferns, large numbers of fertile fronds appearing during the latter half of June. The light brown to brown sporangia, dark brown to nearly black on the red-stemmed form, begin to ripen by the end of June, rarely by the middle of June, and fronds with ripening fruit may often be found as late as August. The pale young fruit dots give the back of the frond a slightly silvery appearance.

In May, 1911, I planted two silvery spleenworts, one along a fence in open sunlight, the other on the fern bed, in partial shade. Both are growing fairly well, but it is a peculiar fact that the fern along the fence, which by this time has formed an elevated circular mass of strong rootstocks, thrives better and produces larger fronds and a greater number of fertile fronds than the one on the fern bed. Neither of them, however, equals the fern in its wild state. The difference in texture of the fronds and in color, yellow-green in the sunlight, green or blue-green in the shade, is quite noticeable in my two plants. The young fronds appear from April 24 to May 6. The first fronds are sterile, the fertile fronds appearing about the middle of June and in July. The young fruit dots are prominent and give the under side of the frond a silvery appearance. The sporangia begin to ripen during the latter part of July and continue to mature on successive fronds till September; but long before the sori open the dark brown sporangia are visible through the pale green or whitish, thick and fleshy, transparent indusium.

For some time the polypody refused to appreciate the care I bestowed upon it; but I now have three clumps of these ferns growing, two between stones of the rock pile and one in the ordinary soil of the fern bed partially shaded by the overhanging fronds of the interrupted fern. The first fronds are mostly fertile and begin growing from April 19 to April 26, the sterile fronds appearing during June. The lemon to dark orange sori, thick, cushiony buttons, ripen their orange to orange-brown sporangia during the latter part of July and the beginning of August.

The beech fern, like the bracken, is addicted more or less to roving habits. In July, 1911, I planted a root-stock containing a few fronds of the broad beech fern. It took kindly to its new home in the fern bed, wandering hither and thither among the other ferns, and, when

crowded by their overhanging fronds, rose to the occasion, lengthened its stipes, and lifted its triangular fronds above the shoulders of its jostling neighbors. The young fronds began to grow late in April or early in May, most of the earliest ones being sterile, and in some years fertile fronds appeared as late as August. The light brown to brown spore cases begin to ripen about or soon after the middle of July and ripe sporangia may be found on some fronds as late as September.

The earliest of the ferns in my garden is the fragile bladder fern. The young fronds appear during the first days of April; and one of my notes of March 27, 1913, states that the crosiers were coming at that time, their green heads beginning to uncoil. In 1915 they began to grow on April 5, but grew very slowly till April 10, when a warm shower, raining at intervals during the night, produced a growth of a full inch till the next morning. Some of the fronds are almost fully grown by the end of April. The first fronds are generally fertile and sterile and fertile fronds continue to appear during June and July. The two plants, brought from a wet place among stones and set in my fern bed in July, 1912, have developed into two beautiful masses of ferns. The black or black-brown sporangia ripen on the earliest fronds by the close of May.

In September, 1910, I brought the rootstocks of two bulb-bearing bladder ferns from a station thirty miles away, the nearest one known, placed them in soil in a box dug into the ground for the winter, and planted them in my fern bed in May, 1911. They thrived splendidly, sending up numbers of their beautiful, slender fronds, and so many young ferns are growing from the fallen bulblets as actually to become a weed in the fern bed, forming a dense stand and crowding out almost everything else. They almost succeeded, in fact, in choking a spinulose shield fern; and I find it

necessary to remove numbers of them each year. Several of these I transplanted to a favorable habitat about two miles away and now have some fine ferns growing there. The old clumps follow the habit of the obtuse woodsia by dying outwards from the middle and producing some fronds a year or two longer on the outer cicle. The fronds of the young plants usually begin to appear soon after the middle of April and those of the old plants about the close of April. One year, however, the first fronds were out on April 7. A large percentage of the fronds are fertile. The black or black-brown sporangia ripen during the last week in June and mature fruit may sometimes be found on succeeding fronds as late as September. The bulblets begin forming as early as the middle of May and some are falling by the middle of July. During July and August I have found bulblets, still clinging to the fronds, which had sprouted to a length of one-half to three-fourths of an inch.

KUTZTOWN, PA.

(To be concluded)

Notes and News

LYCOPODIUM SELAGO VAR. MIYOSHIANUM IN NORTH AMERICA.—Since *Lycopodium Selago* var. *Miyoshianum* does not seem to have been recorded from North America, it will not be out of place to state its synonymy and its diagnostic characters.

LYCOPODIUM SELAGO L., var. MIYOSHIANUM Makino, Bot. Mag. Tokyo xvi. 199 (1902); *L. chinense* Christ, Nuovo Giornale Bot. Italiano iv. 101 (1897); *L. Miyoshianum* Makino, Bot. Mag. Tokyo xii. 36 (1898). Leaves densely crowded, "ascending or spreading in the upper and mostly reflexed in the lower portion of the stem, narrowly linear, 4–6.5 mm. long, 0.5–0.6 mm wide, a little curved upwards, entire, gradually acuminate with a fine point, sessile, ... the upper surface

nearly plane, but a little convex in the inferior ones, the under surface somewhat convex, rather glossy, not firm in living specimens but moderately rigid when dry, green or yellowish green; midrib not conspicuous."

Asa Gray labeled a specimen of this plant, collected in Japan by C. Wright, "*Lycopodium Selago* L. var.," indicating that he felt it, with its abundant setaceous yielding leaves, to be different from *L. Selago* and its varieties, as he knew them.

The specimens cited below are in the Gray Herbarium.

JAPAN: Sapporo, June, 1898; Hakodadi Mountains, *C. Wright*, no. 1, Herbarium of the U. S. North Pacific Exploring Expedition under Commanders Ringgold and Rodgers, 1853–56.

ALASKA: Sitka, *Ferd. Bischoff*, Western Union Extension Telegraph Exploring Expedition, 1865–66 (transitional material).

BRITISH COLUMBIA: Ucluelet, May, 1907, *George Fraser*.

ROCKY MOUNTAINS: *Drummond*.

HAROLD ST. JOHN.

TWO SERIOUS FERN PESTS.—Ferns are ordinarily immune to serious damage both from insects and from plant diseases. The greenhouse varieties suffer to some extent from mealy bug, scale, white fly, and a few other common insects, but serious damage can usually be avoided if sufficient care is taken. Adiantums sometimes have their foliage damaged by eel worms. The bird's nest fern often develops brown streaks in its leaves through an unidentified cause. Fern prothallia are very subject to damping off if the conditions vary from the narrow limits which these capricious plants demand. Hardy ferns have even fewer enemies. In fifteen to twenty years of interest in ferns, I remember seeing only one wild fern afflicted with a plant disease.

and that was a specimen sent me for identification as the host of some rust. Fern foliage is sometimes disfigured by desultory ravages of insects but rarely if ever to the serious injury of the fern plant. For this reason the discovery of two insects which may cause serious injury to ferns is worth recording as warning.

The Florida fern moth as it is sometimes called (*Ereopus Floridensis*) has gained entrance to some northern greenhouses. In one large establishment, it threatened to destroy at least as far as salability was concerned the entire stock of *Nephrolepis* varieties. The damage is due to the depredations of the larvae which are green, brown and black caterpillars, from ¾ to 1½ inches long, and which feed on the fern leaves. The imago is an active nocturnal yellowish moth which remains carefully hidden by day. The pest was finally destroyed by the use of pyrethrum powder, the basis of most ordinary insect powders. This was applied by dusting about at the close of the day and was especially effective when all ventilation was stopped. Pyrethrum owes its effectiveness to a volatile constituent. The powder as purchasable varies considerably in quality, due partly to adulteration with related plants and partly to the use of less active portions of the pyrethrum plant. The partly opened flowers are best. This same pest attacked hardy outside ferns, especially varieties of *Athyrium* during July and August, but were finally got rid of by using a spray consisting of ½ oz. fish oil, soap, and 1 teaspoonful dry arsenate of lead to one gallon of water, applied by very fine spray in the evening.

The second fern pest has not reached the United States as yet, but has begun to do serious damage both to greenhouse and hardy ferns in Great Britain. My information is taken from a recent number (June, 1917) of the British Fern Gazette in which the experiences of several fern growers are detailed. The pest is a small beetle, *Syagrius intrudens*, probably of Australian or-

igin, which attacks all parts of the plant. The eggs are laid in small notches gnawed in the leaf stalks. The larva burrows into the stalk, and thence downward or upward. It may penetrate the rootstock and destroy the growing cells, thus preventing further leaf formation. The larva is white and curved.

No generally successful method of destroying the insect has yet been found. In greenhouse collections it has been found possible to combat it by dipping the potted plants in water over the tops. The beetles then come to the top and can be killed. A large part, two-thirds of the collection of the Royal Botanical Garden, Dublin, was destroyed, however, before the situation was brought under control. At the same place, the entire hardy collection was so seriously affected that what remained was taken up and burned as a means of fighting the weevil. Similar experiences have been reported by other fern growers. It is not yet certain that all fern species and genera are subject to attack, according to one writer, although the Dublin experience would indicate that they are. So far none of the usual spray or gas treatments have proved of any use owing to the position of the beetle within the tissues of the plants.

R. C. BENEDICT.

LAKE GEORGE FLORA STATIONS FOR BOTRYCHIUM LANCEOLATUM.—In the recent catalogue of "The Ferns of the Lake George Flora, New York," *Botrychium lanceolatum* (S. G. Gmel.) Angst. was accidently omitted. It often grows with *B. neglectum* Wood; and intergrading forms are sometimes found. It occurs in white pine woods and mixed woods of hemlock and hardwoods from June 1 to August 31. Town of Galway, Saratoga county (Mrs. Chas. S. Phelps); near Three Ponds and southern W. Fort Ann; and at Vaughns.

STEWART H. BURNHAM.

A GOOD FIND.—In a damp and shady ravine on the side of Rattlesnake Hill, Concord, N. H., some four hundred feet above sea level, Mrs. Carrie J. Elkins has discovered one plant of *Polystichum Braunii*. Search has revealed no more specimens, though granite dumps may cover others. The different authorities on ferns state this species to be found more or less frequently in Nova Scotia, New Brunswick and Quebec, Michigan, northern New England, the Lake George region and even in Pennsylvania along the mountains, but no mention is made of central New Hampshire. There is, however, one plant of *P. Braunii* in the centre of New Hampshire and I have seen it.

SARAH F. SANBORN.

A writer in the Philadelphia North American says that "some mysterious influence in the sunlight causes the fronds of the maidenhair spleenwort to wave backward and forward for a brief time after the plant has been brought into the light. Only the fertile fronds know this trick and they are most active in the middle of the day."

OPHIOGLOSSUM VULGATUM L. IN MONTANA.—This rare fern was found on the grounds of the University of Montana Biological Station at Yellow Bay, Flathead Lake, by Miss Bessie Green in 1914. Since then it has been taken by a number of people at the Station. This year sufficient plants were found to supply specimens for all of the botanists attending, about a half dozen. There are several fruiting patches growing on the edge of a little meadow near the Station building. Early in the season this meadow is submerged. This year the water did not disappear until about the middle of July. So far as I know, this species has not before been reported from Montana.

MORTON J. ELROD.

American Fern Society

Plans are on foot for a meeting of the Society at Pittsburgh in December, in connection with the American Association for the Advancement of Science. Information can be obtained from the Curator.

The Society has received word of the death at London, on August 8th last, of Mr. Charles T. Druery, Secretary of the British Pteridological Society, editor of the British Fern Gazette and since 1900 a valued member of the Fern Society and an occasional contributor to the JOURNAL. Biographical details are not available at present: but readers of the *Fern Bulletin* and the JOURNAL in past years do not need to be told that Mr. Druery's chief interest was in growing ferns and perpetuating their forms, and that he sometimes had scant sympathy with those who found occupation and pleasure among the dead things of the herbarium. He had published several books, the best known of them, perhaps, an elaborate descriptive work on British ferns and their many named varieties and forms.

The Horticultural Society of New York has undertaken to establish a fund to be devoted to the replanting of the orchards in the war-devastated regions of France. This fund will be distributed through the American Red Cross and the Societé d'Horticulture de France. Contributions are especially solicited from all interested in botany and horticulture and may be sent to Mr. George V. Nash, New York Botanical Garden, Bronx Park, New York City.

The Judge of Elections, Mr. H. C. Bigelow, reports the reëlection of the present officers at the annual election. The full text of his report will be printed with the annual reports in the next number of the JOURNAL.

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ERRATA

Page 44, line 12. For var. MINOR, read var. MINUS.
Page 50, line 1. For UNDERWOODIANA, read UNDERWOODIANUM

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American Fern Journal

Vol. 8 JANUARY–MARCH, 1918 No. 1

A new hybrid Asplenium[1]

WILLIAM R. MAXON

Among the ferns forwarded to the National Museum for identification during the past year are the very interesting specimens forming the subject of this article. They were collected from sandstone cliffs of Sand Mountain, about two and one-half miles west of Trenton, Georgia, by Mr. E. W. Graves. The first ones sent in were regarded doubtfully by Mr. Graves as an aberrant form or variety of *Asplenium pinnatifidum*. In the light of further field study, however, and from examination of the additional specimens secured, it appears nearly certain that this form is instead a natural hybrid between *Asplenium Bradleyi* and *A. pinnatifidum*, with which it habitually grows.

At the request of Mr. Graves the hybrid is described below. It is a pleasure to commemorate in this connection the name of the persistent and discriminating collector.

Asplenium Gravesii Maxon, hybr. nov.

Intermediate between *A. Bradleyi* D. C. Eaton and *A. pinnatifidum* Nutt., the fronds few or several, loosely fasciculate, ascending, 10 to 13 cm. long; rhizome decumbent or short-creeping, 1 to 1.5 cm. long, densely paleaceous, the scales about 5 mm. long, linear, long-

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[1] Published with the permission of the Secretary of the Smithsonian Institution.

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attenuate from the very narrow base (about 0.5 mm. broad), rigid, the cells with moderately thick, dark reddish brown, sclerotic partition walls and transparent outer walls, the lumina large; stipe 2 to 7 cm. long, glossy purplish brown nearly or quite throughout, rounded beneath, the upper face flat to sulcate; lamina narrowly triangular, 3 to 8 cm. long, 1.5–2.8 cm. broad, pinnate in the basal part, subpinnate above; rachis usually greenish, flat, and distinctly but narrowly winged (sulcate anteriorly near the base), or in the largest plants more slender, glossy brown, and only faintly greenish-marginate toward the base, both stipe and rachis bearing a few tortuous fibril-like scales: basal pinnae distant, opposite, sessile, triangular, nearly equilateral, subcordate at the base, obtuse or acutish, shallowly crenate-dentate or, in the larger fronds, pinnatifid at the base, the resulting pair of rounded lobes adnate or subsessile; succeeding pinnae or segments gradually smaller, narrower, simpler, and more broadly connected, finally contiguous or even imbricate, passing evenly into the lobate, long-acuminate apex; leaf-tissue rigidly herbaceous or subcoriaceous, the under surface bearing numerous few-celled clavate glandular hairs, these passing gradually into the gland-tipped capillary scales of the vascular parts; sori abundant, dark brown, confluent, variable in form and position, the indusia firm, white.

Type specimen in the U. S. National Herbarium, no. 764407, collected on Sand Mountain, about $2^1{}_2$ miles west of Trenton, Georgia, on sandstone cliffs, September, 1917, by Mr. E. W. Graves. It was found growing singly in the middle of a clump of *A. pinnatifidum*.

Judging *Asplenium Gravesii* on both gross and minute characters, there can be little doubt of its hybrid nature, making all allowance for the unusually high variability of its supposed parents, of one or the other of which

it might at first be thought an extreme state. It exhibits considerable diversity, however. The smaller, stockier individuals most resemble *A. pinnatifidum* in their wholly green rachises and thick leaf tissue; but they differ from *A. pinnatifidum* very definitely in their fewer fronds, sessile basal pinnae, acuminate (never long-attenuate or filiform) lamina, and brown stipe. The largest individual seen is that selected as the type. This suggests, rather, the more specialized parent, *A. Bradleyi*, since it agrees in thinner leaf texture and slender stipe, and shows an approach to dark brown rachises; it differs from *A. Bradleyi* in its very much simpler pinnae and less sharply cut margins, and in having the rachis at least faintly winged. All the plants of the hybrid agree with *A. Bradleyi* in their dark brown sori, the sori of *A. pinnatifidum* being cinnamon brown. The intermediate dissection of the pinnae has already been indicated; the form of the margins is no less distinctive, being midway between the subentire or crenulate margin of *A. pinnatifidum* and the sharply toothed margin of *A. Bradleyi*. The rhizome scales also are exactly intermediate; they are similar in outline to those of *A. Bradleyi*, but have the cells much smaller and separated by thinner partition walls, in both particulars approaching *A. pinnatifidum*. The spores have not been tested for viability; but that the cross is sometimes fertile seems not improbable from Mr. Graves' having recently found a clump of eight well-developed plants growing together.

That the hybrid here described has remained so long undetected may be owing partly to the comparative rarity of *A. Bradleyi* and partly to the fact that it and *A. pinnatifidum* possibly do not often occur in close proximity, in spite of their nearly coextensive ranges. *Asplenium Gravesii* is represented in the National Herbarium only by Mr. Graves' recent specimens.

WASHINGTON, D. C.

Fern Notes

S. FRED PRINCE

I. A FEBRUARY FERN TRIP.—Since my return to the "Cave Region" in the Ozarks of Southern Missouri, I have been trying to reestablish the stations for the ferns listed by me in the Fern Bulletin some years ago.[1]

This has not been easy, as great changes have taken place in the past fifteen years, much of the timber having been removed, many new clearings made, and overstocking on a free open range as well as frequent firing having destroyed much of the wild growth which was found here years ago. In addition, a series of excessively dry years and the denuding action of the very heavy rains common here in winter and spring have very greatly modified the flora of the region.

I have found several species not in my old list, new stations for others, several new varieties, and what I believe are two new species, which I hope soon to place before the Society.

On the 27th day of February last I had a notable fern trip, accompanied by my five-year-old boy, who is as enthusiastic a fern-lover as his father.

We made a circuit down one great ravine and back up another—the distance was short of two miles—time, three hours. From our home on top of the hill to the lowest point was about 350 feet—highest elevation 1200 feet.

The trend of the ravines was southeast.

We found eleven species of ferns in their winter or resting condition, one, the Gray Polypody, new to this part of the country. We have searched closely for miles but have found it nowhere else.

The plants were growing on top of a great boulder in the bottom of a narrow ravine, with mosses, lichens,

[1] Ferns of the cave region of Stone County, Missouri. Fern Bull. 12: 72–77. 1904.

Camptosorus, spleenworts, etc. They were so small and dry, their fronds all curled up (many were not half an inch long), they could scarcely be distinguished from the lichens among which they grew. One plant was particularly interesting. It had the largest fronds (up to 4½ inches long); its branching rhizomes had climbed spirally up the base of a small dead tree to the height of twelve or fourteen inches, appearing so much like a vine with dead-looking leaves, that it could easily have been overlooked.

We have visited the locality several times since, and find that the polypody unfolds and flattens out its fronds during damp or rainy weather, appearing to go on with its business of growing, only to curl up again when dry conditions return.

We found *Cheilanthes lanuginosa* growing in the hollows and crevices of a low cliff in the greatest profusion. It also presented a very dead and dried-up appearance, except in moist weather when it would spread out flat in dense rosettes and become a thing of beauty. The habits of these two ferns would seem to indicate very dry conditions, but with them, on the same rocks, grew also *Cystopteris*, *Woodsia*, and *Camptosorus!*

Pellaea atropurpurea is the common fern here, growing everywhere, even sometimes in the ground, which is very stony. The fertile fronds which were formed last summer and fall are mature, and the sterile fronds growing lustily. There was one large colony, in all stages from prothallia to bare stems of ancient plants, growing in the hollow of an old log, which had a few inches of earth in it.

The sterile fronds of *Woodsia obtusa* and *Cystopteris fragilis* made patches of lively green in the crevices, and *Camptosorus* covered many of the boulders with a dense mat of green. With it, as usual, were the two

spleenworts, *Asplenium ebeneum* and *A. parvulum*, both still carrying their fruiting fronds, which were badly dilapidated, however, the small sterile fronds forming flat rosettes around them. A steep, sloping bank was carpeted for many square yards with the Christmas Fern. There were also three plants of *Asplenium trichomanes*.

We dug up a lot of *Ophioglossum Engelmanni* plants "just to see," and found they were getting ready for the first warm, wet weather.

II. OPHIOGLOSSUM ENGELMANNI.—In March, 1915. I was very much surprised and delighted to come upon a colony of, perhaps, 100 plants of this fern, which, with all my hunting, I had never before found. Before the day's trip was over, I had found it in more than a hundred places, growing on the glades where the soil is sometimes not over three inches deep. Some of the colonies must have numbered thousands of plants.

During the past two years I have made the following observations: They seem to grow most luxuriantly in a black, tenacious soil mostly but a few inches deep, on ledges of limestone which buttress all these hills at about 1000 feet and lower, though there are many colonies growing in the loose, friable stony soil of the higher elevations. A number of plants which I transplanted to the garden (1200 ft) have been doing well for two years. The territory studied so far is about 3 miles long by two miles wide and includes high ridges and deep mountain stream ravines. They were found at elevations from 800 to 1200 feet.

In the area described they occur literally by thousands. I dug up large numbers of plants in several of the colonies and found them often connected by long, slender horizontal, often much-branched rootstocks, forming such a dense network that it was difficult to

separate out unbroken specimens. On some of these there would be plants in several stages of development, some just starting, with a minute fascicle of roots and a mere spot of a bud, to fully mature plants.

In many of the colonies the fronds appear only singly; in others in pairs only; while in other groups both styles occur.

In most of the colonies the fertile fronds are rather rare, not more than one in a hundred bearing the fertile spike.

Sometimes both fronds of a pair will be fertile, occasionally but one, and there were colonies in which every frond was fertile—while in others only the paired fronds were fertile.

Almost without exception where the plant has but one frond, there is a large, well-developed bud close by on the crown, and, also, where there are two sterile fronds the bud is often present; I have never, however, found the bud on those plants which bore two fertile fronds.

I also note that several large colonies which in 1916 produced a large number of paired fruiting fronds have very few fertile fronds this year. I dug up a lot of plants from one of these colonies, and found many of them without fronds at all, and with no visible bud on the crown, though the root-system seemed to be healthy enough.

In the drier situations the fronds are longer and more slender in proportion to those in places more uniformly moist, these latter being thicker and broader, and looking like a different plant.

I have found a few plants well advanced in February; while the great host of plants has its growth and development from the middle of April until the end of May; I have found mature plants in April, in June, in July, and in September and October.

In studying the plant with the upper side of the frond toward me I noticed that the fertile stem did not seem to occur in the middle of the base of the sterile segment, but was adherent to it on the left for about an inch. Of 700 specimens examined in the field, *six* were found to be in the exact center, *none* adherent on the right.

NOTCH, STONE CO., MO.

More Pleasures from Old Fields

H. E. RANSIER

Much that appeared in the previous article relating to the hart's tongue fern and its variations might apply equally well to the walking fern, but because the latter is so common, nearly every one has had opportunities of becoming familiar with it.

On account of its small fronds and its habit of growing so thickly in beds together, it requires a closer and much sharper inspection to detect variant forms, than does its more favored and thriftier growing relative, the hart's tongue.

I certainly enjoyed *discovering* accidentally my first walking ferns, more than I did my finding the hart's tongue where I knew others had done so before me. And the first ones grew within sight of my place of business and barely outside the corporation limits, in a little glade locally known as "Ewer's Gulf," scarcely an eight of a mile long, yet a rarely failing source of pleasure for a ramble any day.

Walking ferns are so widely distributed and common that nearly every one has an opportunity to observe the variant forms, and as the fronds are not affected by much of anything except a severe drought, they may be found at all seasons of the year.

FORMS OF BASAL LOBES IN THE WALKING FERN

(From a photograph by H. E. Ransier)

Specimens growing in exposed places are apt to have spatulate, short fronds and often grow in dense mats, nearly prostrate and covering the ground almost as closely as grass upon a well kept lawn.

The place to look for the more interesting ones may be quite close by, in the wide seams between rocks, if it is a level section that is shaded, else along the edge of ledges, or perhaps down the bank, either on outcropping rocks or loose ones of the talus.

It loves to grow on the large rocks that occur in tumbled confusion in ravines, moss covered, and protected from direct sunlight by the banks above, trees or shrubbery. Once in a while a large flat detached rock will be found while roaming through the woods, where the finest kind of a colony of walking ferns may be found, completely covering its top, and those along the edges drooping down the sides, a joy to look at and easy to search for unusual forms. It is true that some stations yield only normal forms, but quite close by another may be rich in variant forms. Some parent fern of long ago, having a marked tendency to produce abnormal fronds and possessing proper vitality, left its impress upon the neighborhood as shown by the present day finds. For instance, when one locates fronds normal on one side at the base and with a distinct branch or auricle on the other side, this peculiarity may confidently be looked for anywhere within a range of 50 to 100 feet. The bulk of the fronds on some ferns will show this peculiarity, as will also some show lobes on both sides in the particular area where they occur. Forking fronds are much more apt to occur singly, or at most but two or three together.

This is all dry reading. Just go out and find one good sport frond and you will be thrilled a hundred times more than by ever receiving a pressed one from some one else. The beauty, charm and pleasure come from first hand experiences in nature's own realm.

VARIANT TIPS AND BASAL LOBES IN THE WALKING FERN

(From a photograph by H. E. Ransier)

The cuts illustrating this article show fronds about ⅙th their normal size. The figures indicate normal forms. Letters indicate marked variations.

MANLIUS, N. Y.

Experiences with a Fern Garden--III

C. L. GRUBER

The boulder fern has not yet entered upon an era of prosperity in my fern garden. Although the rootstock rambles away a short distance each summer and each spring, about April 30, sends up a few fronds, these fronds do not reach the heigh which is attained in their native habitats and seem to grow more as a special favor to me than from an inclination to establish themselves permanently. Probably the character of the soil is not adapted to more thrifty growth, but I have not yet taken sufficient time to experiment in this respect.

In August, 1912, I planted one maidenhair fern on the fern bed and a row of five along the wall on the northeast side of the cellar containing the heating-furnace. The plant on the fern bed grew poorly and died in 1914; but the row along the warm cellar wall grew luxuriantly and developed into the finest bank of maidenhairs I have ever seen. For a foot or more from the wall the ground does not freeze up as it does further away; and as a result the ferns begin to grow somewhat earlier in spring than they do in a wild state. Most of the first fronds, and a large percentage of all the fronds are fertile. The plant on the fern bed began growing on April 16, but those along the house appeared from April 5 to April 10; and the dark brown sporangia ripened during the first week in July, later fronds maturing their fruit till the close of August or the beginning of September. In 1915 most of the fronds were over a foot in height by April 25.

I transferred a number of sensitive ferns from the border of a marsh to a corner of my fern bed in August, 1911. The sterile fronds came up in spring from April 25 to May 4, but the drier situation retarded their subsequent growth considerably. Sterile fronds continued to appear, in favorable years, during June and July, and it required some vigilance to prevent their spreading into forbidden domains. In 1916, however there was an abundance of rain, the sterile fronds grew to normal size, and this year, for the first time, fertile fronds were produced. These appeared early in July and by the close of July had attained their full size, just about reaching or partly entering the leafy canopy spread over and among them. At the present time, January, 1917, the rolled-up "berries" inclosing the silvery brown sporangia are still closed and will probably not release their contents until the coming of the spring time.

I experienced some rather interesting failures in trying to induce the walking fern to grow. Plants set in the fern bed rarely lasted longer than a year. In September, 1914, I made another determined effort, based on lines of experience and observation. In the shade of Goldie's shield fern I prepared a special dwelling place for these fastidious dwellers of the rocky ledges. Thin, flat plates of limestone were set in an inclined position into a hollowed out part of the bed, layers of woods mold were placed between these plates, and in one of the crevices the roots of a clump of walking ferns were firmly planted. At last I had found the way of doing it. The walking ferns grew and reached out and took root and continued to grow, starting new fronds in spring during the first days of May; and today, without more attention than providing water during dry spells, I have a flourishing colony of these fascinating ferns.

My one experience with the hart's-tongue fern, although interesting, was rather discouraging. I bought

one of these ferns in May, 1911, and planted it in my fern bed. It produced a number of fronds and grew finely in 1911, but remained dormant throughout 1912. Then, on July 21, 1913, it began to send up two very small fronds—and ever since it has failed to make its appearance, dead, by this time, without a doubt.

In August, 1914, I planted six adder's tongues in the fern bed. Five of these appeared in 1915 during the last days of April. In 1916 they did not come up till the middle of May, two of them with fertile spikes. Both of these fertile plants were eaten off near the base during the night while still quite young and in June each of them produced a small sterile blade.

The results of my efforts to grow club-mosses, *Lycopodium obscurum* and *Lycopodium lucidulum*, can be summed up in one statement—complete failure to keep them growing for a longer period than two years. It is my experience that the *Lycopodiums* and probably one or more species of ferns must be provided with the natural soil of their habitats, or with special plant food, to make them grow well. My experience with the mountain laurel and trailing arbutus tends to prove this supposition to be correct. For a number of years I had tried to grow mountain laurels in my yard, but from one to three years was the limit of their existence. Then I tried the plan of filling the hole in which I planted the laurel with the ground which I dug out while securing the plant, mixing the portion above the roots with a liberal supply of half-rotted oak leaves and mulching it thickly with the same material. Each year I furnish it with a supply of decaying oak leaves and for five years my mountain laurel has been growing fairly well.

In general, the dates of the appearance in spring and of the fruiting of wild ferns correspond well with these same periods of growth of the ferns in my fern garden.

Of course, location has a great deal to do with these stages and may change the date by a week or even two.

Some species of ferns wither with the first frosts or soon after the freezing nights of October have set in; but others are decidedly evergreen or have a tendency in this direction. During the last week in November, 1914, the species of ferns still entirely green were the marginal shield fern, spinulose shield fern, the sterile fronds of the crested fern, the polypody, cliff brake, dwarf spleenwort, ebony spleenwort, especially the sterile fronds, walking fern, and Christmas fern, and the grape ferns of course were beautifully bronzed. Goldie's shield fern still was green, but the fronds were drying and apparently frozen. The male fern and obtuse woodsia had a few green fronds, mainly the younger ones, most of those of the male fern being dark bronze; and a small number of maidenhair fronds also were green but drying.

In spring, about the beginning of April, I remove rubbish and superfluous covering from the fern bed, cut off the dead and imperfect fronds, fasten the plants lifted by freezing, and give them other attention that may be necessary.

On March 27, 1915, when I attended to this annual house-cleaning, the marginal shield fern, polypody, dwarf spleenwort, Christmas fern, cliff brake, walking fern, and the grape ferns were still entirely green or almost so. The sterile fronds and a few of the fertile fronds of the ebony spleenwort and most of the sterile fronds of the crested fern were still green. A majority of the fronds of the spinulose shield fern, especially the latter ones or those protected by leaves, were green and fresh in appearance. Even a few fronds of obtuse woodsia, sheltered by leaves, were green, but several erect fronds, which evidently had remained green while drying, were dead and brittle. A few fronds of Goldie's

shield fern still had green patches and one frond, protected by the leaf-covering, was green and living.

Among the curiosities developed in the fern garden were a forked frond of the silvery spleenwort, a forked and crested frond of the marginal shield fern, and several forked fronds of the New York fern.

KUTZTOWN, PA.

Notes and News

In the course of a collecting trip made through Curry County, Oregon, in June, 1917, in company with Professor M. E. Peck of Willamette University, we were fortunate enough to find a very beautiful *Adiantum* which was determined by Mr. J. Francis Macbride of the Gray Herbarium as *A. Jordani* Mueller. The specimen was growing in very dry rocky soil on the north side of the canyon of Rogue River, a few miles below the mouth of Mule Creek, near the deserted mining camp of Solitude Bar. As this species is not mentioned in Professor Sweetser's "Popular Description of the Common Oregon Ferns" (1913), and no specimen of it is included in the herbarium of the University of Oregon, I was inclined to think at first that this was its first occurrence in the State. The range given in Eaton's *Ferns of North America* (I, 286), where it is described as *A. emarginatum* Hook., is "From San Diego, California, to Oregon"; but no specimen to confirm its occurrence in this State is cited. There is, however, in the herbarium of the University of California a specimen collected by Thomas Howell "in the Umpqua Valley, June 20, 1887." Since Eaton's first volume appeared in 1879, this specimen of Howell's cannot be the authority on which Eaton based his reference of the species to Oregon. I can find no collector who has seen it here recently. My own specimen

was collected about fifty miles north of the California line; Howell's specimen still further to the northward. I should be glad to know if any other collector has found this beautiful Californian fern within the limits of Oregon, or if any specimen anterior to Howell's is in existence to confirm Eaton's reference of it to this State.[1]

J. C. NELSON

In the most recent manual covering that part of Oregon west of the Cascades (Piper and Beattie's Flora of the Northwest Coast) the range of *Ceropteris triangularis* (Kaulf.) Underw. is stated as being "mostly near the sea-coast." My own observation leads me to the conclusion that this is slightly misleading, as tending to give the impression that it is not common elsewhere. During the last three seasons I have collected it throughout the whole length of the Willamette Valley from Eugene northward, more than sixty miles from the coast in an air-line, and separated from it by the main chain of the Coast Range. Not only does it occur on the east slopes of this range, but it has crossed the wide alluvial prairies of the Willamette Valley and is frequent in the foot-hills of the Cascades. It is abundant on Spencer's Butte, an isolated rocky hill seven miles south of Eugene, where may be found nearly every species of fern native to Oregon: there is a considerable colony of it on a rocky oak-covered hillside at Turner in Marion County, on the east side of the Willamette Valley; it is not infrequent in rocky woods and pastures about Salem, also on the east side

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[1] Mr. A. F. Hill, of Yale University, has very kindly looked up this matter for us. He finds in the D. C. Eaton herbarium a sheet of *A. Jordani* collected in Oregon in 1871 by Elihu Hall—No. 677 of the Plantae Oregonenses. This is probably the specimen on which Eaton based his statement. The label gives no more definite locality than Oregon.—ED.

of the Valley; and it occurs on Elk Rock, just south of Portland. There is no question here of following a river-valley, as it seems to have done along the Rogue River in southwestern Oregon; it would have had to ascend the Columbia for a hundred miles to the mouth of the Willamette, and up that stream another hundred and twenty-five miles to reach some of the stations. I am inclined to believe that as far as its occurrence in Oregon is concerned, it is in no way dependent on the proximity of the coast, but is just as likely to occur in the interior as along the littoral.

J. C. NELSON

At the invitation of Mr. Rugg and Mr. Underwood I made a brief trip to Windsor County, Vermont, early in July with the purpose of testing the accuracy of my prediction[1] that the Male Fern would be found above 2000 feet on many of the higher hills of central and northern Vermont.

From the contour map we selected two hills of over 2400 feet, one in Woodstock and the other in Reading, and with the aid of Mr. Underwood's automobile we visited them on the 2nd and 3rd of July. Several plants of the Male Fern grew near the summit of each. The Reading station is, as far as reports are available the most southerly in New England.

E. J. WINSLOW

THE MALE FERN AT OWEN SOUND, ONTARIO.—Perhaps twenty years ago there was discovered at this station, by a local botanist, Mrs. Roy, of Royston Park, a new fern, which, at that time, was written up in our local papers as something quite unusual for this

[1] See Fern Journal, 7: 89.

locality, but I have been unable through local sources to discover the name of the fern mentioned.

I wrote of this matter to Mr. A. J. Morris, a botanist of more than local reputation, of Peterborough, Ontario, who spent two weeks botanizing in this locality three years ago, and he included with his reply among other things a fine specimen of "*Aspidium filix-mas*" which he says he took at Royston Park while on the trip just mentioned, and indicated the location as being in the rear of the Rifle Butts, below the Limestone Cliff, west of Owen Sound.

At the first opportunity I drove out to the location indicated, and found directly four lusty plants, full-sized, fertile and sterile, but a little late in the season to take perfect and unblemished specimens. I have not taken time as yet to thoroughly search the talus slope to adequately estimate the size of this station, but will do so very shortly.

The plants grow on rather large sized limestone rock talus, on a slope not wider than 100 yards, in front of a 60-foot cliff, facing east, and are not in deep shade. The trees are mostly Beech, Maple, and a few Cedar, rather open and scattered, letting in a good illumination from above, and will be shaded by the cliff from the hot afternoon sun. They neighbor *Polystichum lonchitis*, *Scolopendrium vulgare* and *Aspidium marginale*, and more splendid specimens of either I have seldom seen.

The elevation above sea level is 799 feet, much lower, I believe, than is their usual habitat.

It appears not a little strange that I had systematically searched for three years for this elusive fern and curiously enough have been within a few hundred yards of it at different times without examining the exact slope where it deigned to dwell.

W. R. McCOLL

MOSTLY INTERROGATIONS.—A novice in fern collecting, like any other hobby, fad, or pastime, naturally gropes around for condensed information and reliable assistance along the special line selected; and like the mercantile shopper wants the most of the best for the least, in the shortest and easiest way; and usually gets what he goes after if average judgment is used in the acquisition.

Lacking much that appeared essential in fern lore and herbarium methods I have taken much time and some trouble to absorb and digest about eight or ten volumes of the "Fern Bulletin" and "American Fern Journal" which were handed to me for perusal by a former subscriber to both; all of which I must say I intensely enjoyed as it only whetted an already sharpened appetite for the subjects in question.

But the items which I was specially interested in failed to materialize. I found, however, one thoughtful editor (I think it was Prof. E. J. Winslow) who said in his inaugural address, "if you do not know, please ask questions, as most of us like to be questioned."

That gentleman certainly understood the requirements of a novice, and I shall follow his kindly advice and ask a few.

First, what is considered the best way to press ferns? What amount of pressure is thought to be desirable, and how most easily applied? What advantage has felt over paper for press driers, and what size is usually used? Will good carpet felt answer? How long should a fern remain in press before changing driers? Are slats, say one inch apart, on top and bottom of press considered better than plain boards, and why? Can anyone manage to press *Athyrium thelypteroides*, *Onoclea sensibilis*, or *Athyrium Filix-foemina* without discoloration, and how? That will do for this time, but I may return again for help; I will not, however, ask so much without returning at least a little.

Spring will be with us and the fern fiddleheads peeping through the soil along with the quarterly delivery of the "American Fern Journal" for 1918, and some may be unable to find suitable conditions in the home garden to satisfy the water-loving ferns, such as *Osmunda regalis*, *O. cinnamomea*, *Aspidium thelypteris*, and possibly a few others, to give them regularly the moisture to which they have been accustomed under normal conditions.

Sink in the garden in a suitable place a deep crockery pan or crock allowing the edge to come within two inches of the soil level; line the bottom with brick or crock pieces for drainage, upon which spread a good thick layer of turfy peat; set your fern upon this foundation and fill to ground level with swamp earth or boggy mould such as these ferns grew in.

This treatment allows the plant to absorb gradually and steadily all the moisture from each rainfall and the same conditions prevail when hand or hose watering is found necessary during dry spells.

For the trouble incurred you will be amply repaid with thoroughly thrifty and healthy plants. If success has not crowned your former efforts try this plan, and enjoy in your home fern garden the regal beauty of the Osmunda family, and any fern that likes a similar habitat.

These delightful fronds are lacking in too many ferneries, simply because their treatment in the new environment has been inadequate to guarantee satisfactory results.

W. R. McCOLL

Certainly we like to be asked questions and will try to answer Mr. McColl's. The best way to press ferns, or any other plants, is in folded sheets of unglazed paper, between driers of heavy felt paper. The folded sheets permit the specimen to be handled when changing driers without disturbing its position; and felt paper is

at once softer and more absorbent than other kinds. The present writer is wont to apply the initial pressure with his foot and, in the absence of recording instruments, is not very sure how much he gets; from forty to sixty pounds is recommended. Stiff, thick, intractable plants take more than thin and delicate ones, and many plants pressed at once more than a few. Some of the best fern specimens I ever saw were made by piling stone paving blocks on top of the press; straps passed around it and pulled tight (especially canvas trunk-straps with buckles which will take hold anywhere, without waiting for a hole to come along) give good results; my own pet press has coarse-threaded wooden screws, taken from some old carpenter's clamps. The usual size for driers is about 12 by 17 or 18 inches—a little larger than the standard herbarium sheet. The first change of driers should be made not longer than 24 hours after the specimens are put in press. Slats are better than solid boards for the top and bottom of the press because they permit a more rapid evaporation of moisture. The species mentioned, or any other of our native ferns, can be pressed without discoloration if the driers are changed often enough. As a general rule, the faster the drying process, the better the resultant specimens. Finally, it may be remarked that there is a popular book, entitled "Plant Preservation" and published by the F. A. Stokes Co., New York, which gives rather full directions for pressing plants.

C. A. W.

Prince Roland Bonaparte is constantly receiving, in his great fern herbarium, numbered collections from various sources and from many different regions, some specimens of which are, inevitably, either wrongly identified or sent out without names. He has undertaken to determine these misnamed or nameless specimens, describing new species and varieties where necessary, and to publish the results for the benefit of others who may have sets of the same collections, in a series of brochures which he calls "Notes Ptéridologiques."[1] Four fascicles have already been issued, comprising nearly 700 pages and dealing with species

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[1] Le Prince Bonaparte. Notes Ptéridologiques. Paris. Fascicule I. pp. 230, July 14, 1915. II, pp. 219, Dec. 2, 1915. III, pp. 27, Dec. 3. 1916. IV, pp. 123, May 19, 1917.

from almost all parts of the world. Their usefulness to owners and curators of large collections is obvious; to such, Prince Bonaparte is doing a real and generous service.

M. Henri Gadeau de Kerville of Rouen has published, in two beautifully printed pamphlets, illustrated with fine photogravure plates, five "Notes sur les Fougères."[3] Note 1 is a comparative list of the species of ferns occurring in Europe, France and Normandy. 74 species, two of them doubtful, are listed from Europe: 50 from France and 25 from Normandy. These totals may be compared with our 64 from the Gray's Manual region, and 115 from that covered by Small's Flora of the southeastern United States. In note 2, the author protests against the bestowing of scientific varietal names on minor, often abnormal variations in leaf-form. He gives point to his protest by relating how he produced no less than three named "varieties" from a single clump of normal, wild hart's-tongue by simply transplanting it to his conservatory; and that the "varieties" showed a strong tendency to return to the normal form as they became used to their new environment. Note 3 deals with experiments in growing 22 species of ferns in complete darkness—a condition in which ferns, unlike most other plants, are able to produce some chlorophyll. The coloration of scales also remains normal. Some individuals remained alive for as long as five years without a ray of light. All which lived at all produced abnormally long, weak stipes and rudimentary fronds, which, in the case of simple fronds, did not progress beyond the crozier stage. Note 4 contains a table, showing the altitudinal

[3] Gadeau de Kerville, Henri. Notes sur les Fougères. Extraits du Bulletin de la Société des Amis des Sciences naturelles de Rouen. 1 and 2, pp. 139–166, pls. 4 and 5. 1913 (reprint, 1915). 3, 4 and 5, pp. 161–214, pls. 10–23. 1914–5 (reprint, 1917).

distribution of French ferns. Eight species reach altitudes above 2500 meters. These are *Woodsia alpina*, *Cystopteris fragilis*, *C. montana*, *Dryopteris Filix-mas*, *D. spinulosa*, *Polystichum Lonchitis*, *Asplenium viride* and *Cryptogramma crispa*. It is interesting to note that all of these occur in North America, with the exception of the last, which is represented here by the closely related *Cryptogramma acrostichoides*. Five species, *Trichomanes radicans*, *Hymenophyllum tunbridgense*, *H. peltatum*, *Asplenium marinum* and *Pteris cretica* are found only below 500 meters, and of these none occurs certainly in North America, though a *Trichomanes* of the southeastern United States has been referred to *T. radicans*. Note 5 deals with the inrolling of growing fronds in certain plants of the hart's-tongue, a phenomenon which M. Gadeau de Kerville believes to be due to some abnormality in the structure of the plant which prevented a sufficient supply of water from reaching the leaf-tissue.

C. A. W.

AMERICAN FERN SOCIETY

ANNUAL REPORTS OF THE SOCIETY

Report of the President for 1917

In accepting this office it seemed to me that besides exercising such general knowledge of the Society's affairs as seemed possible, I should be present at its yearly meetings. Accordingly I made it a point to be present at the meeting in Brooklyn on the evening of December 29 and to exhibit and talk on some specimens from my collection. The meeting was thoroughly enjoyed by all present and I am sure that no one regretted their attendance and that all were well pleased by the hospitality of the Brooklyn Botanical Gardens and its accomplished representative, Dr. Benedict. A very interesting and with us a popular exhibit was

the part of the gardens devoted to the outdoor growth of ferns, the only regret being that we could not examine them together in summertime.

It was my intention to visit Pittsburgh during Convocation week of the American Association and hold a meeting. Efforts were shaping to that end when unfortunately an accident happened to me on November 24, which confined me almost helpless to the house until the middle of January.

As to the supervisory knowledge of the affairs of the Society, it is sufficient to state that the budget for the year has been properly carried out, the experience of past years studied and utilized in the preparation of the budget for the coming year. The Secretary and Editors have really carried the burdens of the Society and are deserving of all praise, as well as the Treasurer and the Curator of the herbarium, whose work is equally onerous, but not as evident. Their reports should be carefully read and will show that there is a constant effort to keep expenses within limits and always to save a little every year for unforeseen uses.

It is hoped that we may hold a well attended meeting next December.

WILLIAM PALMER, *President.*

Report of the Secretary for 1917

The year, for the Society, has been quiet, with few out-standing events to record, but reasonably prosperous. Our usual activities have, with the one exception of a delayed number of the JOURNAL, gone smoothly forward. A meeting in combination with the Appalachian Mountain Club was held at Boston in May, and one was planned for December at Pittsburgh in connection with Convocation Week of the American Association for the Advancement of Science. War conditions, however, and accident so interfered with

this latter that the program planned for it was finally not given.

Several notable additions have been made to the Society's literary possessions. By an exchange with the *Philippine Journal of Science*, we have acquired a nearly complete set of Section C, Botany, of that publication, containing many of Dr. E. B. Copeland's important papers on tropical ferns. M. Henri Gadeau de Kerville has generously presented to the Society several copies of his "Notes sur les Fougères" and "Considerations et Recherches sur la Direction des Racines et des Tiges." Mrs. Annie Morrill Smith, on behalf of the Sullivant Moss Society, has turned over to us a quantity of duplicate numbers of the *Fern Bulletin*. Mr. Winslow has given a set of Prince Bonaparte's *Notes Ptéridologiques*, and Mrs. Noble a copy of Vol. 4 of the *Fern Bulletin* and one number of Vol. 3. Members are again reminded that they may borrow any literature owned by the Society.

Two members, Mrs. Hurd and Mr. Druery, have died during the year. Five have resigned; five have been dropped for non-payment of dues. Twenty-one new members have been received, and the membership now (Dec. 31, 1917) stands at 270, a gain of nine over last year and, again, a new record for the Society. For three years now we have, each year, scored a small advance in number of members over anything previously reached. This slow, but apparently solid growth carries with it much encouragement; again, we must all do our part in seeing that it continues during the coming year. More than ever is such effort needed now, when the war and the paramount duties which it brings to many of us absorb so much of our energies; and when, nevertheless, the light of science and the love of truth need, more than ever, to be kept alive and nature offers us more of peace and profit than in less troubled times.

C. A. WEATHERBY, *Secretary*.

Report of the Treasurer for 1917

Receipts

Cash on hand, Jan. 1, 1917		$ 70.02
Membership dues for 1915	$ 2.00	
" " " 1916	13.75	
" " " 1917	190.35	
" " " 1918	11.00	
" " " 1919	1.00	
		218.10
Subscriptions for 1916	$ 1.80	
" " 1917	31.29	
" " 1918	6.55	
		39.64
Emergency Fund, bal., acct. of *Dryopteris* sets	$ 4.99	
" " sale of back numbers of JOURNAL	50.20	
		55.19
Interest		6.00
Advertising		4.00
Gifts for illustrating fund		16.25
Incidental receipts		.80
		$410.00

Disbursements

Secretary's expenses: postage, election of officers, list of members, etc.			$ 23.40
Treasurer's expenses: postage and printing			15.00
Curator's expenses: herbarium supplies			8.87
JOURNAL expenses: Printing		$183.19	
Illustrating, regular		7.70	
" special fund given		16.40	
* Editors' expenses		11.54	
			218.83
Insurance on back nos. of JOURNAL, Order of Council No. 25			1.85
			$267.95
Balance, Dec. 31, 1917			142.05
			$410.00

This balance was divided as follows:

Emergency Fund (income from sale of back numbers of JOURNAL and other irregular sources)		$ 55.19
Illustrating Fund: On hand, Jan. 1, 1917	$ 5.90	
Receipts	16.25	
	$ 22.15	
Paid for illustrations	16.40	
Balance		$ 5.75
Carried forward		$ 60.94

* One bill for postage and other expenses of the 1917 JOURNAL is not yet received, owing to the delay in receiving No. 4 from the printer.

Brought forward	$ 60.94
Set aside by Council Order No. 22 for printing catalogue of Herbarium	25.00
Regular fund, available for all Society expenses	56.11
	$142.05

COMPARISON OF BUDGET AND PAYMENTS

Item	*Allowance*	*Payment*	
President's expenses, postage, etc.	$ 2.00	$ 0	(no bill rec'd)
Vice-president's expenses, postage, etc.	1.00	0	" " "
Secretary's expenses, printing, etc.	25.50	23.40	
Treasurer's expenses, printing, etc.	15.00	15.00	
Curator's expenses, herbarium supplies	10.00	8.87	
JOURNAL expenses: editors' expenses	12.00	11.54*	
" " publishing expenses	230.00	190.89	

The Treasurer again mentions his appreciation of the coöperation of the officers and members of the Society.

JAY G. UNDERWOOD, *Treasurer.*

Report of the Editors for 1917

The Editors greatly regret the long delay in issuing the last number of the JOURNAL for the year. The entire edition was mislaid by the express company in transit between the printers' and Auburndale, whence the JOURNAL is mailed—a misfortune doubtless due to the over-strain which war conditions have put on every means of transportation.

With this untoward exception, the JOURNAL has had a good year. We have had a very generous and welcome gift of four fine plates from Mr. Ransier. We have been further fortunate in receiving articles of rather more than usual variety, and have a good prospect of continuing this pleasing condition during the coming year. We have been, for most of the time, one or two numbers ahead on copy. Under these circumstances, articles containing descriptions of new species and, to some extent, illustrated articles, are given the right of way; others are printed in the order of their receipt, except when occasional mechanical

difficulties in fitting them into a fixed number of pages prevent. We could still use a good deal more money; we still live in desire, rather than any immediate hope, for the time when, either through endowment, or a large increase in the Society's membership, we shall have funds enough to print extra pages and extra illustrations whenever the matter for them is forthcoming.

R. C. BENEDICT,
E. J. WINSLOW,
C. A. WEATHERBY,
Editors.

Report of the Curator for 1917

Several valuable accessions have been made to the Society Herbarium during the past year. The names of the donors and the number of sheets contributed by each is as follows:

Macy Carhart	254
E. W. Graves	17
L. A. Wheeler	45
F. E. Corne	16
H. C. Bigelow	24
U. S. National Museum	219
Total	**575**

Mr. Carhart's collection was composed mostly of specimens from New Jersey. About half of this collection was nicely mounted—a fact that was greatly appreciated by the curator. Mr. Graves' collection was from specimens collected in Alabama; Mr. Wheeler's from Vermont; and Miss Corne's from various localities in New England. Mr. Bigelow's set was made up of *Dryopteris* hybrids from the Society's distribution of the same. They were all mounted.

The 219 sheets received in exchange from the U. S. National Museum were mostly of tropical species and

included many new to the Herbarium. Fifty-four sheets in this set were mounted when received.

The total number of mounted sheets now in the Herbarium is 3001.

Seven members availed themselves of the privilege of borrowing specimens from the Herbarium for study during the last year.

The Herbarium needs specimens from the southern and western states with the possible exception of California. Specimens from all the Rocky Mountain states are needed. Members are urgently requested to keep these facts in mind and send in from time to time such specimens as are available from these localities. Also, remember that many varieties and forms of the more common species are still needed from other localities.

L. S. HOPKINS, *Curator.*

Report of the Judge of Elections

TO THE SECRETARY OF THE AMERICAN FERN SOCIETY:

The undersigned, Judge of Elections by appointment of President William Palmer, respectfully presents the following report of the balloting at the annual election held in October, 1917:

Whole number of ballots cast **96**

For President

William Palmer	**95**
Rev. John Davis	**1**

For Secretary

C. A. Weatherby	**95**

For Vice-president

Mrs. Mary Adam Noble	**95**

For Treasurer

Jay G. Underwood	**95**

I therefore declare the election of Mr. William Palmer as President, Mrs. Mary Adam Noble as Vice-president, Mr. Charles A. Weatherby as Secretary, and Mr. Jay G. Underwood as Treasurer of the American Fern Society for 1918.

HENRY C. BIGELOW,
Judge of Elections.

November 1, 1917.

The JOURNAL is feeling, in some ways, the effect of war conditions. As noticed in the Editors' report, the entire edition of the last number was temporarily lost by the express company, causing a delay of about two months in issuing it. Other numbers may also be behind time. The officers will do their best to keep the business of the Society going and up to date, and can only beg the members to be patient with delays and inconveniences which cannot be avoided.

Through the kindness of Mr. Ware and Mr. Winslow, the Secretary has received a copy of the *British Fern Gazette* containing a notice of the late Mr. Charles T. Druery. The notice gives little biographical information, but emphasizes the industry, carefulness and intelligence of his scientific work, culminating in his important observations on apospory; his wide knowledge of ferns and his enthusiastic interest and success in growing them and perpetuating unusual forms. It calls attention, also, to a side of his nature less familiar to most of us—his love of fun, which found vent in countless quips and puns and in occasional humorous articles contributed to horticultural journals. These were often over the pen names of "Willyum Grubbins" (reputed gardener and apostle of very phonetic spelling) and "Prof. Ananias Waggles." It was the latter who maintained that any flower could be doubled at will by the judicious application (to the horticulturist) of sufficient quantities of "mountain dew"; and who discovered that though the female of a certain fossil species of animal was entirely hairless, the male was quite generally "*Hirsuter*." The former once expressed very pithily Mr. Druery's own opinion on nomenclatorial questions: "Take your cue from Kew and stick to it." Several of these humorous papers have been collected and published in a little volume entitled "The Tatur Disees and other Essays."

If a sufficient number of members are interested, I shall make a distribution of the species belonging to the genus *Polystichum* next fall. With this purpose in mind I wish to ask two things, viz., the loan of specimens in this group which are now in the herbaria of members of the Society. Such specimens should not be sent before the first of next September, should be plainly marked with the full name or initials of the owner and would, of course, be returned postpaid; second, that all those who are so situated that it is possible for them to do any collecting make abundant collections of such species of this genus as are accessible and send them in to be distributed amongst those who make contributions to the general exchange. I have the promise of a considerable quantity of *P. Jennings*i for this exchange and may be able to secure several specimens of *P. Andersoni*.

L. S. HOPKINS.

The following should be added to the list of errata on page 130 of Vol. 7:

Page 38, line 3 from bottom. For Institute, read Institution.

Page 54, line 28. For The var. **Michauxii** (Spreng.) n. comb., read The var. MICHAUXII (Spreng.) Farwell.[1]

Table of Contents to Vol. 7, line 24. For DEC. 17, read FEB. 23, 1918.

[1] Mr. Farwell published this combination in Ann. Rep. Mich. Acad. Sci. 18: 79. Jan., 1917, about four months before Mr. Burnham's article appeared—a fact unknown to the editors at the time.

American Fern Journal

Vol. 8 APRIL–JUNE, 1918 No. 2

Polystichum Andersoni and Related Species[1]

WILLIAM R. MAXON

Among the genera of ferns probably none has been regarded as subject to greater subspecific variation than Polystichum. How much of this supposed polymorphism is due to high variability actually existing within the species and how much to a failure to recognize constant characters peculiar to like individuals from natural geographic areas is not altogether clear. It is clear, however, that some of the widely distributed types split up into readily recognizable forms, marked by good structural and vegetative characters, and that in many instances what might, with scant material, appear a chance variant is in reality a well characterized constant form throughout a given area, needing only to be studied in the light of ample collections to obtain recognition as a sharply defined species. The West Indian specimens, for example, had been characterized vaguely as belonging to a few variable species; yet a critical study of a large amount of material has shown[2] that for the most part the plants fall readily within the rather narrow limits of numerous species. These are mostly of restricted range; and although their distinguishing characters are sharply marked, it is not difficult to arrange them, on general resemblances, in natural groups whose members have obviously had

[1] Published with the permission of the Secretary of the Smithsonian Institution.

[2] Contr. U. S. Nat. Herb. **13:** 25–39. *pls. 2–9*. 1909.

[No. 1 of the JOURNAL (**8:** 1–32. Plates 1 and 2) was issued May 6, 1918.]

a common origin. In the matter of scant variation two exceptions are noted in *P. adiantiforme* and *P. triangulum*. The former is a very widely distributed plant of both hemispheres, and the latter an inherently variable species of wide extremes in leaf proportion.

The Polystichums of continental America offer greater difficulties, largely from lack of adequate material. The present paper deals with three forms ranging from Washington to Alaska. Two of these have been described by Mr. L. S. Hopkins as *P. Andersoni* and *P. Jennings*i. The third, here characterized as new, is from Alaska. The three species differ among themselves much less than the West Indian species; but the characters given below seem to be distinctive and, in the absence of intermediate plants, to justify their acceptance, temporarily at least, as full species. As a group, they are nearest related apparently to *P. Braunii*, differing from that species in their simpler pinnae and more strongly aristate segments.

Fronds not proliferous, lacking scaly buds upon the rachis; pinnae mostly horizontal (those of the basal third somewhat deflexed), close, linear-oblong, their apices acutish to long-acuminate; segments spreading, oblong, oblong-ovate, or rhombic-ovate, mostly auriculate or subauriculate, subsessile to semiadnate, slightly or not at all decurrent. 1. *P. alaskense.*

Fronds proliferous, 1 or 2 scaly buds invariably present on the rachis 4–10 cm. from the apex of the lamina; pinnae mostly ascending, more remote, narrowly elongate-triangular, tapering gradually from the base or near it, attenuate; segments oblique, of an elliptical type and (excepting the basal ones) adnate or semiadnate, long-decurrent.

Lamina lance-elliptic, gradually reduced toward the base, the basal pinnae about one-third as long as the middle ones; middle pinnae distinctly elongate-triangular from the base, 4 or 5 times as long as broad at their middle. 2. *P. Jennings*i.

Lamina narrowly lance-oblong, only slightly reduced downward, the basal pinnae one-half to two-thirds as long as the middle ones; middle pinnae much more slender, very narrowly triangular, narrowed above the elongate basal segments, 7 or 8 times as long as broad at their middle. 3. *P. Anderso*

1. **Polystichum alaskense** Maxon, sp. nov.

Rhizome stout, ascending or decumbent, very densely paleaceous, the scales rich chestnut brown in mass, yellowish brown individually, concolorous, thin, translucent, linear-attenuate to broadly ovate and long-acuminate, irregularly denticulate, 1.5–2 cm. long. Fronds several, 50-90 cm. long, apparently forming a close crown; stipes stout, 8 22 cm. long, strongly arcuate at the blackish base, deeply sulcate, copiously paleaceous, the scales extremely variable, minute and linear to ovate-acuminate and 1.5 cm. long, denticulate; lamina 30 70 cm. long, 9-18 cm. broad near the middle, narrowly linear-lanceolate to linear-oblanceolate, long-attenuate at both extremities, 3-5 cm. broad at the base, subbipinnate; rachis densely and persistently paleaceous, the scales mostly small, linear to lanceolate; pinnae 25-40 pairs, close, mostly alternate, spreading (those of the basal third somewhat deflexed), straight or nearly so, the middle ones the largest, these 4.5-9 cm. long, 1.5–2.5 cm. broad, linear-oblong, acutish to long-acuminate, nearly pinnate in their basal half, pinnately cleft toward the apex; larger segments 10–16 pairs, spreading, close or contiguous, oblong-ovate or rhombic-ovate, auriculate or mostly subauriculate, subsessile to semiadnate and short-decurrent, serrate, the teeth curved and mostly appressed, tipped with stiff whitish awns, these 1-2 mm. long, spreading or more commonly incurved over the upper surface of the segment; midribs and lower surfaces fibrillose-paleaceous, the upper surface sparingly so, glabrescent; sori 3-6 pairs, large, nearer the midrib than the margin, borne on the basal branch of the oblique, mostly once or twice forked veins; indusia large, persistent, orbicular, pale with a darker center, erose-dentate, the teeth gland-tipped. Leaf tissue rigidly herbaceous, opaque, dull dark green above, paler beneath.

Type in the U. S. National Herbarium, no. 277737, collected at Helm Bay, Cleveland Peninsula, Alaska, in rich soil of forested mountain slope, July 19, 1901, by J. B. Flett (no. 1917).

Besides a second frond of the type collection, the following additional specimens are in the National Herbarium:

ALASKA: Sitka, *C. V. Piper* 4561; *J. P. Anderson* 2; *H. C. Cowles* 1076. Yes Bay, moist mountain slopes, *M. W. Gorman* 242, 1728. Head of Russell Fiord. *Coville & Kearney* 942. Point Gustavus, Glacier Bay, *Coville & Kearney* 724. Without special locality, *W. H. Dall.*

The presence or absence of a proliferous bud upon the rachis seems here, as in the West Indian species, a character of first importance. The specimens above cited were mostly determined as *P. Braunii*, which likewise lacks this distinctive structure. *Polystichum Braunii* occurs not infrequently in Alaska, sometimes in company with *P. alaskense* (e. g., Sitka, *Bischoff, Evans* 164; Yes Bay, *Gorman* 178) and is known to the writer from a single locality in British Columbia (Salmon River, Ymir District, *W. C. Sandercock;* Herb. Canadian Geological Survey, no. 89854).

2. POLYSTICHUM JENNINGSI Hopkins, Ann. Carnegie Mus. **11:** 362. *pl. 37.* 1917.

Type.—Collected along bank of the Nisqually River, near Longmire Springs, Rainier National Park, Washington, August 18, 1915, by O. E. and Grace K. Jennings (no. 9960); in the Herbarium of the Carnegie Museum.

Agreeing with the type in all essential characters and differing only in their lesser size and much shorter stipes are the following specimens, all in the National Herbarium:

WASHINGTON: Horse Shoe Basin, Okanogan County. "moist soil of thickets in dead woods near the snow

limit," Sept. 1897, *A. D. E. Elmer* 707; same locality, "rocky slopes, alt. 5000 ft.," Aug. 20, 1897, *M. W. Gorman* 709. Mount Rainier, alt. 4000 ft., "old moraines, in shade of alders," Aug. 28, 1902, *J. B. Flett* 2020.

The affinity of this species is clearly with *P. Andersoni*, from which, however, it is distinguishable by the characters stated in the key and under that species, below.

3. POLYSTICHUM ANDERSONI Hopkins, Amer. Fern Journ. **3:** 116. *pl. 9.* 1913.

Type.—Collected at Elk River, Strathcona Park, Vancouver Island, British Columbia, Aug. 2, 1912; in Herbarium of the Geological Survey of Canada, no. 83121.

In addition to the actual type the writer has examined several fronds taken from the original plant, which was transplanted to a garden at Sidney, B. C. Through the courtesy of Mr. James M. Macoun three of these have been placed in the National Herbarium. A single additional collection has been seen:

BRITISH COLUMBIA: North Fork of the Illecillewaet, alt. 3500 ft., Aug. 26, 1904, *C. H. Shaw* 566.

Supplementing the characters given in the key, it may be mentioned that *P. Andersoni* is a more rigid plant than *P. Jennings*i and has the pinnae decidedly more slender, even the basal pinnae being very narrowly triangular and attenuate, as opposed to the short-triangular or oblong-triangular, acutish basal pinnae of *P. Jennings*i. The teeth of the segments are less curved also; and the bristle-like tips arise more abruptly, appear longer, stiffer, and more slender, and mostly diverge more widely. The upper surface of the segments is not "smooth," as stated in the remarks following the original description of *P. Jennings*i, but is scantily fibrillose-scaly, the few minute scales in both species being readily abraded, however.

WASHINGTON, D. C.

An Annotated List of the Pteridophytes of Northwestern Ontario

O. E. JENNINGS

During the summers of 1916 and 1917 my wife and I continued our botanical work in northwestern Ontario. We have now spent the major part of five summers in this region, articles having been published in the AMERICAN FERN JOURNAL on the itinerary and pteridophytes collected in 1912, 1913, and 1914. *See* literature cited at the end of this article (6), (7).

It has been thought best to assemble the various collections as well as possible this year, as the amount of material secured on these various trips and the number of localities visited will enable us to publish a fairly comprehensive and complete list of the flora of a considerable part of Ontario lying to the north and northwest of Lake Superior. During 1916 we went again to Sioux Lookout, about two hundred miles northwest of Lake Superior, remaining there over a month and working that region over quite thoroughly. In 1917 we spent the first half of the summer along the line of the Canadian Northern Railway, east of Lake Nipigon, stopping first at Longuelac, a station at the north end of Long Lake, and distant about seventy-five miles east of Lake Nipigon and an equal distance north of Lake Superior. This region is one of little relief, there being much spruce muskeg from which rise the low rounded hills and rolling lands of rounded rocks and glacial soils.

The second stop of 1917 was at Jellicoe, about half way between Longuelac and Lake Nipigon, approximately on the divide between the Hudson Bay and the Lake Nipigon drainage; the region being one with extensive sand-plains (glacial terraces) from which rise rounded rocky hills of considerable size and into which the Blackwater River has excavated a deep and often lake-like channel. There are also numerous smaller

lakes and ponds, those in the sand-plain often being without outlet, other than by seepage.

The latter part of the 1917 trip was spent along the Canadian Government Railway, northwest of Lake Superior, first at Hunt, and then back to Oscar, about one hundred and sixty-eight and one hundred and eight miles, respectively, northwest of Fort William. At Hunt the country consists of moraimal knolls and ridges, the deeper hollows being occupied by muskegs or by lakes, of which there are a great number, large and small. At Oscar much the same topography prevails, but with more sand and gravel in the moraimal deposits and with some considerable areas of sandy plain. Here also the lakes are very numerous, and, as at Jellicoe, some of those in the sand-plains are without outlets.

To briefly summarize: The localities visited during the five seasons have included, for usually about two weeks' stay each, the following main stops (or bases) along the north shore of Lake Superior: Heron Bay, near the mouth of the Pic River; Rossport; Nipigon; Fluor Island; Magnet Point; Porphyry Island; Silver Islet, Thunder Cape; and Fort William; and the following inland stations: Longuelae, north end of Long Lake; Jellicoe; Orient Bay, at the south end, and Ombabika Post at the north end of Lake Nipigon; Slate River, about three miles southeast of Stanley and fifteen miles west of Fort William; Loon Lake; Oscar; Hunt; and Sioux Lookout, or Graham. Many other localities, often at some distance from these bases, were visited briefly, such as St. Ignace Island; Jackfish; Kakabeka Falls; first rapids of the Kenogami; Pelican Falls, south side of Lac Seul, etc.; while the region within a radius of five to ten miles of the main bases was explored pretty thoroughly. The explorations have thus covered a territory of about 200 miles along the north shore of Lake Superior, and many of the islands and peninsulas

of that part of the lake, while, inland, the localities extended to the north end of Lake Nipigon, about 110 miles north of Lake Superior, and from Long Lake, east of Lake Nipigon, to Sioux Lookout, west, a distance of about 275 miles, altogether extending over a region of perhaps twice the size of New Jersey.

The distribution of plants in this part of Canada is highly interesting and deserves to be better known. Like the neck of an hour-glass, it constitutes a very much narrowed connecting link between the wider eastern and western distribution areas of many northern species, or perhaps between species of close relationship. In the latter category may be mentioned the Salmon Berry (*Rubus parviflorus*), a western species reaching the northern shore of Lake Superior and closely related to the eastern *Rubus odoratus*, which reaches Michigan to the west. Similarly the western Devil's Club (*Fatsia horrida*) meets in this region the eastern Bristly Sarsaparilla (*Aralia hispida*). The same principle seems to apply with regard to some of the pteridophytes, as noted farther on in this article in the list of species.

In the following list of our collections the writer has attempted to note also the localities in which other collectors have found the various species. The frequent references to Macoun refer to the Catalogue of Canadian Plants by John Macoun (*See* literature cited.—9). Our own records are all substantiated by one or more sheets of specimens in the Herbarium of the Carnegie Museum, and many of these are also represented by duplicates in the Herbarium of the American Fern Society. Most of the specimens have been identified, or at least verified, by Prof. L. S. Hopkins to whom I express my grateful appreciation. The general ranges mentioned for a number of the species listed have been based mainly on the last editions of Gray's *Manual* and Britton & Brown's *Illustrated Flora*.

SKETCH MAP OF THE REGION EXPLORED IN 1912–1917

The heavy round dots indicate the main stopping places. Only the larger lakes and streams have been indicated, no attempt having been made to show the hundreds of smaller lakes and ponds.

LYCOPODIALES

1. LYCOPODIUM SELAGO L. This interesting species was reported by Macoun for high exposed rocks ten miles south of Otter head, on the northeastern shore of Lake Superior, also north of that locality, while, in 1912, Mr. Daily and I collected it on Jackfish Island, along the middle northern shore of the lake, about sixty-five miles northwest of Macoun's locality. This island had a deep covering of Sphagnum and other mosses together with Cranberries, *Empetrum nigrum*, *Vaccinium uliginosum*, etc., altogether a remarkable association of far northern species.

2. LYCOPODIUM LUCIDULUM Michx. John Macoun reports this as very common through northern Ontario. Our stations are in protected valleys along streams or shores: Orient Bay, south end of Lake Nipigon; south of Nipigon; base of Rabbit Mt., near Stanley; and along Lake Superior at Maloney's Harbor, Magnet Point, and channel at Porphyry Island. Our collections do not include the species from the northern end of Lake Nipigon nor our inland stations either east or west of there.

3. LYCOPODIUM POROPHYLLUM Lloyd & Underw. Margin of little pond, west side of Surprise Lake, Thunder Cape. This is the most northwesterly station reported for the species, which ranges from Newfoundland and Quebec to Wisconsin and south to Missouri and South Carolina.

4. LYCOPODIUM INUNDATUM L. This species, with a range from Newfoundland to New Jersey and west to Washington and Alaska in cold bogs and on cold sandy shores, was noted by Agassiz along the north shore of Lake Superior on his famous cruise in 1848, but it, evidently, has not often been found in this region. Our only collection of it was on a compact, sandy, open, but somewhat boggy bank of a little creek three miles south of Oscar, along the Canadian Government Railway one hundred and five miles northwest of Fort William.

5. LYCOPODIUM ANNOTINUM L. Usually in well drained mixed woods, but apparently rather indifferent as to substratum, being found on rocky shores, sand-hills, or glacial boulder moraimal deposits, occasionally even penetrating spruce-sphagnum muskegs. Longue-lac, north end of Long Lake; Jellicoe; Ombabika, north end of Lake Nipigon; Sioux Lookout Knob, Graham; Hunt; Oscar; middle of western shore of Long Lake; Virgin Falls, south end Lake Nipigon; Rossport; Jack-fish; Nipigon; Little Fluor Island; Porphyry Island; Silver Islet, Thunder Cape; Loon Lake; Fort William; Stanley.

LYCOPODIUM CLAVATUM AT SILVER ISLET
(*Photograph by O. E. Jennings, Aug. 2, 1914*)

5a. LYCOPODIUM ANNOTINUM var. PUNGENS Desv. In dense spruce-sphagnum bog at Heron Bay and at Pay's Plat, along the northern shore of Lake Superior.

6. LYCOPODIUM CLAVATUM L. Usually on thin sandy or rocky soils; in spruce woods on rocky hills and cliffs or in mixed woods of birch, aspen, etc., at a lower ele-

vation. Heron Bay; Orient Bay, south end of Lake Nipigon; Nipigon Palisades; Thunder Cape; Loch Lomond, Fort William; Loon Lake; Rabbit Mt., Stanley; Oscar; English River Falls, Hunt; Sioux Lookout. Macoun refers to this species as common in eastern and northwestern Ontario.

6*a*. LYCOPODIUM CLAVATUM var. MONOSTACHYON Grev. & Hook. On rocky outcrop at side of muskeg, Commee, twenty miles north of Nipigon.

6*b*. LYCOPODIUM CLAVATUM var. MEGASTACHYON Fern. & Biss. In spruce-birch woods on clay-sand-boulder soil one mile east of Sioux Lookout. The spikes in these specimens are from 3–5 cm. long, the peduncles up to 11 cm. long. The range of this variety is given as Quebec and Cape Breton Island to Connecticut, and west, locally, to northern Michigan (Rhodora **12**: 50–55. March, 1910), hence our locality is an extension of range to the northwest.

7. LYCOPODIUM OBSCURUM var. DENDROIDEUM (Michx.) D. C. Eaton. Mostly on rocky knols, bluffs, and talus slopes in spruce woods, but extending also to sandy or clayey moraimal deposits and sandy shores. Longuelac, Long Lake; Jellicoe; Orient Bay, Lake Nipigon; east side of Lake Helen; Palisades, Nipigon; Alexander Portage, Nipigon River; Rossport; Sleeping Giant Mt., Thunder Cape; Mt. McKay, Fort William; Oscar; Hunt; Sioux Lookout Knob, Graham. Macoun says of *obscurum*: "Very common in the central counties of Ontario and westward around Lake Superior.

8. LYCOPODIUM SITCHENSE Rupr. Reported by Macoun from Magpie River, north of Lake Superior. The general range is from Labrador and Quebec to northern New England and New York, and from Alaska to Washington, the Lake Superior station forming the intermediate connecting link between these eastern and western regions.

9. LYCOPODIUM SABINAEFOLIUM Willd. Eastern Quebec to Vermont and New York. Also reported from Magpie River, north of Lake Superior.—Macoun.

10. LYCOPODIUM COMPLANATUM L. Very few of the specimens collected in the Lake Superior region seem to be of the species, most of them being more typical of the variety *flabelliforme*. The following are probably referable to the species: Longuelac, north end of Long Lake; Jellicoe; Little Fluor Island; Tee Bay, Thunder Cape.

10*a*. LYCOPODIUM COMPLANATUM var. FLABELLIFORME Fernald. On rocky knobs and bluffs with spruce, or lower in aspen or Banksian pine woods. Middle western shore of Long Lake; Nipigon Palisades; Orient Bay, south end of Lake Nipigon; Silver Islet Harbor, Thunder Cape; Graham. Under *complanatum*, Macoun notes: "Very common in cool woods throughout northern Ontario and westward to Lake Nepigon and Kakabeka Falls, Ont., and Swan Lake, Man." these localities probably referring mainly to the more recently described var. *flabelliforme*.

10*b*. LYCOPODIUM COMPLANATUM forma WIBBEI (Haberer) Clute. The range given for this form is northern Vermont and central New York (Gray's Manual), but among our specimens there have been referred to it the following collections: Orient Bay, south end of Lake Nipigon; Silver Islet Harbor, Thunder Cape; and Sioux Lookout.

11. LYCOPODIUM TRISTACHYUM Pursh. With Banksian and red pine on steep gravel ridge (esker) about one and one-half miles north of Watcomb, Can. Gov. Ry. about one hundred and sixty-one miles northwest of Fort William, Aug. 24, 1917. In size and appearance these specimens match almost identically *L. tristachyum* as collected by E. J. Winslow at Hartland, Vermont, July 5, 1910. The reported distribution for this species

is northern Maine to Delaware and south in the mountains to North Carolina. Also Lake Superior. The Watcomb station is thus a notable northwesterly extension of range.

12. SELAGINELLA RUPESTRIS (L.) Spring. On exposed rocks and cliffs, mostly along shores. Reported from New England and Ontario to Georgia and the middle West. In the Lake Superior region Agassiz reported it for the north shore of the lake and Macoun for the east coast of Lake Nipigon. Our collections are from: Heron Bay; Rossport; Nipigon; Livingston Point, n. e. shore of Lake Nipigon; shores of Pelican Lake and pockets at top of Sioux Lookout Knob, Graham, these latter records being perhaps the most northwestern reported for the species.

13. SELAGINELLA SELAGINOIDES (L.) Link. This circumboreal species extends south in North America to New Hampshire, Michigan, and Colorado. Noted by Macoun as "Very common along the north shore of Lake Superior and shores of Lake Nepigon," but collected during our five seasons in that region twice: Under alder fringe at edge of Maloney Harbor, Magnet Point, Lake Superior; and at mouth of cold springs in flat sandy-marly bog, margin of small lake at Jellicoe.

14. ISOETES BRAUNII Dur. (*I. echinospora* var. *Braunii* (Dur.) Engelm.) On open sandy clay or gravel bottoms of fairly quiet but not stagnant water, at a depth of three inches to two feet. East shore of Orient Bay, Lake Nipigon; near English River Falls and shore of Jarvis Lake, Hunt, Can. Gov. Ry. This is mainly a northern species, but ranging south to Pennsylvania in the east and to California in the west. Our specimens are, however, possibly of an undescribed species or variety.

EQUISETALES

15. EQUISETUM ARVENSE L. Mostly on sandy shores or sandy glacial terraces: Rossport; Nipigon; Longuelac, north end of Long Lake; Fluor Island and Magnet Point, Lake Superior; Stanley.

15*a*. EQUISETUM ARVENSE var. CAMPESTRE Schultz. On gravelly island at lower end of rapids, Nipigon, and (fine fruiting specimens) on sand-gravel railroad embankment, C. N. R., east of Longuelac, north end of Long Lake.

15*b*. EQUISETUM ARVENSE var. DIFFUSUM A. A. Eaton. Sandy strand, Orient Bay, and along trail, Ombabika Post, Lake Nipigon; wet sawdust along shore of lake at Hunt, C. G. Ry.

When our material was gotten together it became apparent that the more typical *arvense* was represented only from the Lake Superior and Long Lake collections while, to the northwest, around Lake Nipigon and west of there, only the varieties were represented. Although I can not state definitely, I do not believe that the typical *arvense* occurs, at least commonly, in the latter districts, or it would have been collected.

16. EQUISETUM PRATENSE Ehrh. With a general range from Nova Scotia and Quebec to Alaska and south to the northern U. S., this is reported for the shores of Lake Nipigon and Lake Superior by Macoun, and our collections include it from mixed woods on glacial till at Longuelac, north end of Long Lake. Certainly not common in western Ontario.

17. EQUISETUM SYLVATICUM L. Restricting this name to the plants with shorter and more recurved branches, our specimens are from: Heron Bay; Pay's Plat; Jackfish; Porphyry Island; Longuelac; Stanley; and Oscar. Mostly in spruce-sphagnum bogs, but on old sand dunes at Stanley.

17*a*. EQUISETUM SYLVATICUM var. CAPILLARE (Hoffm.) Milde. Mostly in deep spruce-balsam woods on moist, but not too boggy, soil, but also on various other habitats, such as burned over glacial till or granite, or even muskeg. Rapids on Kenogami River, seven miles below Longuelae; Jellicoe; Lake Helen, north of Nipigon; Orient Bay and Ombabika Post, Lake Nipigon; Porphyry Island, Lake Superior; Mt. McKay and Crystal Lake, south of Fort William; Hunt; Sioux Lookout.

18. EQUISETUM PALUSTRE L. This widely distributed species, extending from Newfoundland to Alaska and south to New York, Illinois, and Arizona, is distinctly rare in the district explored. Macoun reports it from the east side of Lake Nipigon, our collections not including it.

19. EQUISETUM LITORALE Kuehl. On wet sandy shores from New Brunswick to Pennsylvania, Ontario, Minnesota and west to British Columbia. Reported by Macoun at Little Flat Rock Portage, south of Lake Nipigon. Our collections include it from Longuelae; Fort William; and North Ombabika Peninsula, north end of Lake Nipigon.

20. EQUISETUM FLUVIATILE L. (*E. limosum* L.) This widely distributed species occurs in shallow waters, swamps, and bogs; in open shallow water with a sandy bottom often forming large areas of dense and practically pure associations. Our collections include it from Longuelae; Fort William; Hunt; Nipigon; Lake Jessie, twenty miles north of Nipigon; Orient Bay, south end of Lake Nipigon; and (in boggy spruce-sphagnum woods) at Ombabika, north end of Lake Nipigon.

21. EQUISETUM LAEVIGATUM A. Braun. This species, occurring from New Jersey to Ontario, North Carolina, Mexico, and British Columbia, is reported but once in western Ontario, based on our collection along the boggy margin of the Nipigon River, below Nipigon, June 30, 1912.

22. EQUISETUM HIEMALE var. INTERMEDIUM A. A. Eaton. This North American variety of *E. hiemale*, ranging from Connecticut to Michigan, Texas and California, occurs in our collections from: Open upper beach, Orient Bay, Lake Nipigon; shore of little lake in sand-plain, Jellicoe. So far as known this is a considerable extension of range to the northwest.

23. EQUISETUM VARIEGATUM Schleich. Reported for "Sands, Lake Nepigon."—Macoun. Our collections are best referred to the following variety:

23*a*. EQUISETUM VARIEGATUM var. JESUPI A. A. Eaton. The reported general range of this variety is: Quebec and Ontario, south to Connecticut and Illinois (Gray's Manual). It was found by us on a sandy beach, Pelican Lake, Sioux Lookout, and at Sandy Point, Orient Bay, Lake Nipigon. The specimens from the latter place were reported in the earlier list as *E. hyemale* L., but further study has convinced the writer that they are *E. variegatum*, var. *Jesupi*. (See A. A. Eaton, Fern Bull. **12:** 23 25. 1904.) Under *ramosissimum* Macoun reports an *Equisetum* from Speke's Point, southeastern Lake Nipigon, which from his notes is probably to be referred to *Jesupi*. The variety *Jesupi* is evidently a hybrid between *E. variegatum* and *E. hiemale* (Ruth Holden. The Anatomy of a Hybrid Equisetum. Am. Journ. Bot. **2:** 225 237. Pls. V-VIII. May, 1915.)

23*b*. EQUISETUM VARIEGATUM var. JESUPI forma MULTIRAMEUM Blake. Specimens with slender upper branches and thus referable to Blake's form were growing with the var. *Jesupi* at Sioux Lookout.

24. EQUISETUM SCIRPOIDES Michaux. Ranging from Pennsylvania and Illinois northwards to Labrador and British Columbia, this species is reported by Macoun as very common throughout northern Ontario, and was collected by us as follows: spruce-sphagnum bog at

head of Ombabika Bay, Lake Nipigon; south shore of North Ombabika Peninsula; Orient Bay, south end of Lake Nipigon; *Thuja-Alnus* thicket, shore of lake at Jellicoe.

PITTSBURGH, PA.

(To be continued)

A Vermont Fern Garden

HAROLD GODDARD RUGG

When I first became interested in ferns, my interest was largely in the herbarium specimens, but soon I began to desire to see the growing plant and to be able to study its growth. In the years of my collecting I have seen growing in their natural habitat practically all of the ferns credited to Vermont, and at some time or other I have had plants of them growing in my fernery at Proctorsville, Vermont. In some cases, however, the rarer ferns have survived but a year or two.

An ideal location for a fernery is a northern exposure, possibly the north side of a house. My fernery in such a location has plenty of shade, the ground retains its moisture longer than in other locations and the soil is free from tree roots. The soil is ordinary loam, but to this I add leaf mould.

I have succeeded with all the ordinary ferns, including some which like *Woodwardia virginica* L. (Sm.) need rather moist conditions. My *Woodwardia* however has never produced fertile fronds. *Woodwardia areolata* (L.) Moore, not a native of Vermont, plants of which may be purchased from two of our dealers, does well and has fruited nearly every year.

One of the ferns I was most anxious to have growing in my fernery was *Lygodium palmatum* (Bernh.) Sw. I sent for plants of this several times to two nursery-

men, but to no avail, for the fern never lived beyond the first season. Finally I was able to visit a station for this fern and took up a root with a large amount of soil and had no difficulty in making the plant live. This fern has grown and fruited well in my fernery and is one of my most attractive and treasured plants. Later I received from a dealer another plant taken up with a large amount of soil and this plant too has done well. Both plants are in a rather dry part of my fern border.

As for the Botrychiums I have tried them all from *Botrychium simplex* E. Hitchcock to *B. obliquum* Muhl. but the only one that has really flourished is *B. virginianum* (L.) Sw. *B. obliquum* has sometimes survived but *B. simplex* and *B. ramosum* (Roth) Aschers. and *B. lanceolatum* (Gmel.) Angstroem, var. *angustisegmentum* Pease & Moore have always died, even though I have taken up a large amount of soil with the roots. I even sent to England for a root of *B. lunaria* (L.) Sw., as that is represented in the Vermont flora by a single specimen collected at Lake Willoughby, but that too went the way of the others.[1] Possibly some reader of this article can tell me how to grow successfully the members of this interesting family.

For several years I have had five growing plants of *Camptosorus rhizophyllus* (L.) Link. This is in a slightly raised bed with other ferns, but I have placed small pieces of marble throughout the soil.

Asplenium viride Huds. has done well for two or three years and then died as has *Woodsia glabella* R. Br. and *Woodsia alpina* (Bolton) S. F. Gray and *Asplenium Ruta-muraria* L. *Woodsia ilvensis* (L.) R. Br., *Woodsia obtusa* (Spreng.) Torr., and some of the western Woodsias and *Polypodium vulgare* L. do well if rocks

[1] Since the above was written, a small colony of *B. lunaria* has been found near St. Johnsbury, Vt.

are placed near the roots or if a small rockery can be constructed.

Of the Vermont rock ferns I have had the greatest difficulty with *Pellaea atropurpurea* (L.) Link. Pot-grown plants thrive the first season but never appear the second spring. *Asplenium septentrionale* (L.) Hoffm. did well for a season but died the second year after a struggle for existence.

Others with good facilities for an elaborate rockery will doubtless succeed with many of these rock ferns which have troubled me so much.

The many varieties of the Lady fern which may be purchased in England and from Dreer in this country are a welcome addition to the fernery and need no special treatment.

Two very interesting and attractive ferns with which I have been successful are *Lomaria spicant* and *Asplenium goringianum pictum* from Japan.

Four of the choicest and most treasured ferns I have came from plants originally in the garden of the late Mr. George Davenport. These were given by Mr. Davenport to Mrs. Emily Hitchcock Terry and very kindly passed on to me, years later, by Mrs. Terry. These are *Dicksonia punctilobula cristata* (Maxon) Clute, *Aspidium thelypteris Pufferae* (A. A. Eaton) Robinson, *Aspidium spinulosum*, var: *concordianum* (Davenport) Eastman and *Aspidium pittsfordense* (Slosson) Eastman. I might say that the ordinary Dicksonia does well in a sunny exposure or the south side of the house and is an attractive cover for a stone underpinning. One of the hardiest and most easily grown of our native ferns is *Aspidium Filix-mas* (L.) Sw. and an interesting fern for one's fernery is *Scolopendrium vulgare* Sm., but in Vermont this sometimes suffers from our severe winters.

HANOVER, N. H.

Some Recent Fern Literature

Professor F. K. Butters, of the University of Minnesota, has recently published[1] a thorough-going taxonomic study of the American lady-ferns. In distinguishing species, he has placed little weight on details of the form and cutting of the frond, taken by themselves, but has sought more reliable characters in indusia, scales, spores and the like. His conclusions may be summarized as follows:

1. The genus *Athyrium* is abundantly distinct from *Asplenium*, with which it has been, until recent years, united by American authors, but, as already pointed out by Milde and Copeland, is closely related to, and not very clearly separable from, the tropical genus *Diplazium*. It is also closely related to the more primitive species of *Dryopteris*, and probably arose from some form similar to *D. Thelypteris*.

2. The silvery and narrow-leaved spleenworts, which have been more or less handed back and forth between *Asplenium* and *Athyrium* in recent manuals, really belong in neither, but should find a resting-place in *Diplazium*.

3. The lady-fern of the Northwest, *Athyrium cyclosorum* Rupr., is identical in all essential respects with the original *A. Filix-femina* of Europe and should bear that name. The eastern lady-ferns fall into two species, distinct from each other and from true *A. Filix-femina*. For the benefit of our readers who may be interested and who may not have access to Prof. Butters's paper, the names and ranges of the three American species and a synopsis of their characters, as worked out by him, are given below.

[1] Butters, Frederic K. Taxonomic and Geographic Studies in North American Ferns. I. The Genus *Athyrium* and the North American Ferns allied to *Athyrium Filix-femina*. II. *Botrychium virginianum* and its American varieties. Rhodora **19:** 170–216, figs. 1–5, pl. 123. Sept., 1917.

Rootstock erect or ascending, the young growth surrounded by the bases of the old fronds; stipes usually ¼ to ⅓ as long as the frond, rather densely scaly near the base, the scales usually pale brown, their cells readily visible under a handlens, about 6 times as long as broad; frond widest in the middle, tapering about equally both ways; well-developed indusia usually less than 1 mm. long and proportionally broad, ciliate with long, multicellula reilia: spores yellowish and sparsely papillate. Alaska to New Mexico and California. Two varieties.

Athyrium Filix-femina (L.) Roth.

Rootstock horizontal or somewhat oblique, the young growth at the end, in advance of the bases of the old fronds; stipes proportionally longer; well-developed indusia usually 1 mm. or more in length, proportionally narrower.

Rootstock oblique, densely covered with the bases of the old fronds, stipes up to ½ as long as the fronds, their scales usually dark brown, with cells 15 times as long as broad, not visible under a hand-lens; indusia (averaging 1.1×0.5 mm.) toothed on the margin or with a few short, one-celled or rarely multicellular cilia; spores yellowish, smooth or sparsely papillate.—Labrador to Manitoba, southward to southern New England, Pennsylvania, northern Missouri and the Black Hills. Probably also in eastern Asia. Six varieties and forms.

Athyrium angustum (Willd.) Presl.

Rootstock creeping, not densely covered with the bases of the old fronds; stipes about as long as the fronds, their scales similar to those of *A. Filix-femina*, but usually few; frond widest near the base; indusia (averaging 1.3×0.45 mm.) glandular-ciliate; spores blackish, reticulate or wrinkled.—Florida to Texas, north to Missouri, Indiana, Ohio and along the Atlantic coast to eastern Massachusetts. One variety.

Athyrium asplenioides (Michx.) Desv.

Professor Butters's treatment of this complicated group seems to the present reviewer altogether workmanlike and convincing, the more so because the ranges of his three species fall into agreement with what are coming to be recognized as laws of plant distribution. The plant of Europe, skipping eastern North America and re-appearing in the Northwest; the plant of north-

eastern America, unknown in Europe but appearing in eastern Asia; the plant known only from the coastal region of the eastern United States and portions of the Mississippi basin, are already old friends to students of plant geography. Moreover, the two eastern species were described long ago and have been very generally considered by European botanists and fern-growers as distinct from the European lady-fern; only in their own country have they been without honor. All three species will have their difficulties for the beginner, since the really crucial characters by which they are distinguished are microscopic; but there are enough obvious differences in rootstock, outline of frond and length of stipe to make them recognizable, after a little study, to the amateur, unarmed with a compound microscope. All three vary considerably and along essentially parallel lines in the shape and cutting of pinnae and pinnules; such differences cannot be depended upon in naming specimens.

In a similar study of *Botrychium virginianum*, Professor Butters distinguishes seven geographic varieties of that species, characterized chiefly by the size, color and manner of dehiscence of the sporangia.

"Fern Notes," by Mr. O. A. Farwell,[1] presents, the author tells us, the results of several years' researches in field, herbarium and library. They will be of the more interest and stimulus to fern students, because Mr. Farwell has his own point of view and, both in his use of names and in classification, is inclined to depart from the usage familiar to us in current manuals. For instance, he reduces *Lycopodium sabinaefolium*, *L. tristachyum*, *L. alpinum* and *L. sitchense* all to varieties

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[1] Farwell, Oliver Atkins. Fern Notes. Ann. Rep. Mich. Acad. Sci. 18: 78–94. fig. 13. 1917.

of *L. complanatum*, maintaining that they differ from it no more than *L. obscurum* and its variety *dendroideum* from each other, and by similar characters. In matters nomenclatorial, he makes a further assault on the unfortunate name *Dryopteris*. Nieuwland has already pointed out that this name is antedated by *Thelypteris* of Schmidel (1762). Mr. Farwell goes still further back and takes up Filix of Hill. His reason is that Hill in his "Family Herbal," published in 1755, uses the "binomials" *Filix Mas* and *Filix Foemina* as the captions of paragraphs descriptive of the male fern and the bracken, the former coming first. The point is technical; but to the present writer's mind there is no doubt that Hill's use of this name, without generic description of his own or reference to another, utterly fails to fulfill the conditions of valid publication laid down in the Vienna Rules and that, under these rules, at least, the correct name for the genus is *Thelypteris*. In view, however, of the hundreds of new combinations required, and the many changes of name the genus has already suffered, no one has shown himself very eager to take it up, though Dr. Rydberg has made a beginning in that direction.

Other points of interest in Mr. Farwell's paper are as follows: He suggests that, since *Asplenium pinnatifidum* occasionally produces fronds with lanceolate, acute lobes of various lengths similar to those of *A. ebenoides*, it may also be a hybrid of the walking fern and the ebony spleenwort, verging toward the former parent as *A. ebenoides* toward the latter. He gives an enumeration of varieties of the lady fern occurring in Michigan, to which, however (since Mr. Farwell wrote before Prof. Butters's paper, noticed above, appeared) names are given which were originally applied to forms of the European lady fern and are therefore not applicable to the American plant; rather extensive notes on *Botrychium* and *Ophioglossum;* and descriptions

of a new variety of *Botrychium multifidum* (*B. ternatum* or *B. silaifolium* of the manuals) and one of *Lycopodium obscurum*.

Vaughan McCaughey has contributed to *Torreya* an interesting account of the genus *Gleichenia* in the Hawaiian Islands.[2] There are only four Hawaiian species, but they are important because they are the most abundant ferns of the archipelago and because one of them, *G. dichotoma*, is, so to say, a forest weed. It takes possession of clearings in the mountain woods, driving out all other vegetation and forming dense and impenetrable thickets 2 to 8 ft. high and often hundreds of square rods in extent. Its fronds grow to be 20 ft. or more in length and owing to their habit of branching repeatedly, become intertwined with neighboring fronds, forming dense, interlocked masses, garnished with the hard, sharp and thorn-like bases of old branches broken off—a formidable obstacle to the mountaineer, and a menace to the economic value of the forest.

Uluhi, as the Hawaiians call this fern, has no present usefulness. Cattle and goats will eat its fresh foliage if they can get nothing better; and Mr. McCaughey suggests that its elastic stems might be used in basket-work: otherwise this black sheep in the mostly pleasing and harmless family of ferns seems to have no redeeming features.

Mr. Maxon, continuing his studies on *Notholaena* and related genera, has published some notes on western species of Pellaea.[3] In these he points out that the

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[2] McCaughey, Vaughan. The genus Gleichenia (Dicranopteris) in the Hawaiian Islands. Torreya **18:** 41–52. March, 1918.

[3] Maxon, W. R. Notes on western species of Pellaea. Proc. Biol. Soc. Wash. **30:** 179–184. Dec., 1917.

name *Pellaea mucronata* D. C. Eaton properly applies to the fern long known as *P. ornithopus* Hook., and that *P. Wrightiana*, as it has generally been understood in recent years, really includes three species, true *P. Wrightiana*, a second long ago described by Hooker as *P. longimucronata* and a third, likewise already described by Davenport as a variety of *P. Wrightiana*, (though it is much more closely related to *P. mucronata*) and now raised to specific rank as *P. compacta* (Davenp.) Maxon.

Some, at least, of our readers will remember Dr. W. N. Steil as the discoverer of apogamy in the purple cliff-brake. He has been for some six years carrying on further studies of apogamy in various ferns and now has published some of the results.[4] He has found several new cases of apogamy in the genera *Pellaea*, *Pteris* and *Aspidium* (used by him in the Eatonian sense to include *Dryopteris*, *Tectaria* and *Polystichum*) and concludes that it is a rather common phenomenon in these genera and a constant one in some species. He describes the manner in which embryo plants are produced without fertilization. Antheridia are usually developed on apogamous prothallia and give rise to sperm-cells apparently normal and capable of functioning. Archegonia are much more rarely produced. In a few cases the same prothallium produced two embryos, one apogamously, the other apparently as the result of fertilization.

One of Dr. Steil's most interesting experiments was the attempt to induce apogamy in the royal fern, a normally non-apogamous species, by preventing fertilization for a year and a half. The attempt entirely

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[4] Steil, W. N. Studies of some new cases of apogamy in ferns. Bull. Torr. Bot. Club **45**: 93–108. pls. 4 and 5. March, 1918.

failed. The occurrence of apogamy appears to be not at all dependent on external conditions (cultural, at least), but an inherent trait.

C. A. W.

Notes and News

FERNS OF THE OSAGE NATION, OKLAHOMA.—The Osage Nation or Osage County occupies a large part of north central Oklahoma, extending from the Kansas State line south to the Arkansas River. So far as the writer is aware, little has been published on the ferns of this or other parts of the state and it is believed that a few brief notes on the ferns of the region will prove of interest.

Woodsia obtusa, *Pellaea atropurpurea*, and *Asplenium platyneuron*, are the most abundant species and are common everywhere on sandstone, the prevailing type of rock in the eastern part of the county. *Cheilanthes lanosa*, *Filix fragilis*, *Dryopteris marginalis*, *Asplenium trichomanes*, and *Selaginella rupestris* can usually be found also where sandstone outcrops.

On the limestone ledges *Notholaena dealbata* and *Pellaea atropurpurea* are everywhere abundant. *Pellaea glabella* was found at a number of places in Osage County, also in Pawnee and Kay counties and in Butler County, Kansas, but it is rather rare.

Ophioglossum engelmanni is one of the most common plants of the region. It is especially abundant in thin limestone soils, but also was noted frequently on shale and sandstone soils.

Along the Arkansas River in both Osage and Pawnee counties *Cheilanthes tomentosa* was found in large patches on dry sandstone cliffs. It was not found in similar situations farther north.

Camptosorus rhizophyllus was found in three places on moist sandstone cliffs and one large colony of *Poly-*

podium polypodiodes was noted covering the face of a sandstone ledge where it rises from the edge of a creek.

The two rarest species appear to be *Adiantum capillus-veneris* and *Osmunda regalis*. Near Fairfax, along the foot of a dripping sandstone cliff is a fifty-foot bank of the Venus-hair fern. Another large colony was seen in Logan County near Guthrie. Of the royal fern only three or four plants were found, but the locality was not thoroughly explored. The plants were growing at the edge of a small pool along a spring fed branch—a rarity in this region.

One fern-ally, *Selaginella rupestris*, has been mentioned. The only other noted is *Equisetum hyemale intermedium* (*E. laevigatum* as interpreted by Mr. B. F. Bush). It is common here as elsewhere in north central Oklahoma.

This list is small, comprising only 17 species in all, but it is considerably larger than the first impressions of the region would lead one to expect. The absence of the Christmas and maidenhair ferns is noteworthy as they are both abundant to the north and east in Kansas and Missouri.

F. C. GREENE.

A NEW STATION FOR BOTRYCHIUM LUNARIA IN VERMONT.—It was on the afternoon of July 9, 1917, while I was taking a little trip over the hills in a typical Vermont pasture, that I located a small colony of *Botrychium Lunaria*. I had never seen it growing before but recognized it immediately from the fleshy texture and crescent shape of the pinnules. It was somewhat past the prime of its fruiting season but I cut two or three specimens close to the ground, marked the spot and left the others to grow.

My two best specimens were about four inches tall and the sterile segments have nine and eleven divisions

respectively. The fertile segments are typical in form but had scattered their spores. Many small sterile fronds were growing in that vicinity so I am expecting much better results from another trip which I propose to take to that locality in June, 1918.

This station is located at an altitude of about 800 ft. on a dry sterile hillside four or five miles northwest of the village of St. Johnsbury but within the town limits.

INEZ ADDIE HOWE.

FORKING FRONDS IN ADIANTUM CAPILLUS-VENERIS.—On September 3 last, with two other botanically inclined companions and one conchologically obsessed I took a trip to Eaton Canyon, which cuts its way into the San Gabriel Mountains between Mt. Lowe and Mt. Wilson, for the purpose of spending a pleasant holiday in congenial surroundings and gathering such specimens of natural history as might please our fancy. While exploring the upper reaches of the canyon, one of my friends called my attention to a forking frond of *Adiantum Capillus-veneris* L. and asked if it was common. Now I had not before particularly noted any such forms so we began looking for them to see if they were at all common. During the next hour or two we found perhaps a dozen fronds from simply forking dichotomously once to a quite compound form in which the two forks split up much after the manner of the veins of the pinules, making quite a crested end for the frond. I do not remember having seen any notice of such forms in this species so pass the observation along for the benefit of those who like to look for variations from the normal.

GEO. L. MOXLEY.

Some time ago, there appeared in *Science* a very sensible letter from Prof. Clute on common and scientific names of plants. The moral of it—and a very good moral, too, is, in substance, this: that the demand among amateurs for English names and nothing but English names has much in it that is unreasonable and even hurtful to the study of botany. Among common names, the same one is often used for different plants and different ones for the same plant, so much so that they are, as a class, hopelessly inexact just where precision is a prime requisite. Latin names were expressly designed for exact reference and though botanical usage is not yet wholly uniform, fulfill their purpose very well. Nor are they so hard to learn and remember as the beginner is apt to suppose, forgetting that he has already assimilated a good many of them, such as aster, geranium, rhododendron, chrysanthemum and the like. Moreover, the attempt to create a sufficient supply of English names by simply making them up, one for each species, has not proved a shining success. Wherefore, though English names that have really grown up in popular usage are by no means to be neglected, pupils should be taught and amateurs brought to understand that scientific names have a real reason for existence, and should be used.[1]

All this strikes the present writer as in general very good, indeed. Nevertheless, ferns may be, to some extent, an exception. Next to birds, they seem to have the greatest attraction for the beginner and amateur in natural history, whose way may properly be made as easy as is consistent with scientific exactness.

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[1] Perhaps this might be facilitated if, in teaching, the Latin names were more often translated for the benefit of a generation which will not learn Latin. It might help to know that Polypodium and Pteris and Cryptogramma are not mere arbitrary sounds, but mean "many-footed" and "a wing" and "hidden line" and all refer to some quality of the plant to which they are applied.

The ornithologists appear to have devised a generally accepted and sufficiently precise set of common names for the birds of the United States. The same could perhaps be done for the ferns, for the number of species concerned is not hopelessly large; and it would be a suitable task for the Fern Society. The first step would be to find out what common names are actually in use for ferns in different parts of the country; and the editors will be glad to receive any information along this line which members can give.

C. A. W.

American Fern Society

The Council has passed an order providing that members in the military service of the United States may retain their membership for the duration of the war or of their active service without payment of dues. So far, we have heard of one who has gone to the front—Mr. Walter Mattern, now serving with one of the engineer regiments. The Secretary will greatly appreciate it if those who are in a position to do so will inform him of any others of our members who are in the army or navy, that our honor roll may be made complete.

The early volumes of the *Fern Bulletin* are now rare and difficult to get. They contain, besides interesting matter relating to the early activities of the Society, more or less of the first work of such men as C. E. Waters and A. A. Eaton, descriptions of a few new species, and notes on and illustrations of the rarer and more interesting among the old ones. And they would be useful in filling out sets. One member has suggested that the Society undertake to reprint Vols. 1-6 of the *Bulletin*, page for page, adding that he would be quite willing to pay ten dollars for the set. At a rough guess,

it would need 50 or 60 subscribers at that rate, or a correspondingly larger number at a lower price, to enable the Society to meet the considerable expense of reprinting. The work might be done piecemeal, one or more volumes at a time, so that payments could be distributed over a more or less long period. Or, the cost could be reduced—perhaps cut in half—by reprinting only the scientific matter with the original paging indicated.

Now, we wonder how many, members or not, individuals or institutions, want such a reprint? Will those who do notify the editors and state the limit to which they are willing to go in the matter of price and what form of reprint they would prefer? The more subscribers, the less the cost to each.

New Members:

Butler, Mrs. Ellis Parker, 242 State St., Flushing, N. Y.
Comstock, John Belden, New Britain, Conn.
Eames, Mrs. Edward A., 155 Bryant St., Buffalo, N. Y.

Change of Address:

Bates, Miss Ethel, Box 39, South Berwick, Maine.

Vice President Noble, acting as president in the absence of Mr. Palmer, has appointed Mr. C. H. Bissell, of Southington, Conn., chairman of the committee to nominate officers for the year 1919. All concerned are reminded that nominations made by any three members in good standing and sent to Mr. Bissell before August 20, will be placed on the official ballot with the committee nominations.

American Fern Journal

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The Jamaican Filmy Ferns

FORREST SHREVE

The students who have been working for many years to unravel the history of the vegetable kingdom, have given us a very clear and convincing body of proof that our terrestrial plants have developed from aquatic ancestors. It is doubtful if any single event in plant evolution is of greater importance than the emergence from ponds, rivers and lakes, and the development of characteristics which make life possible on dry land. We are familiar with the necessity of water for fertilization in mosses and in the prothallia of ferns, and the fact is very impressive when we realize that none of the ancestors of these plants were ever free of dependence upon water or films of water for this critical act in their life histories. The emergence of plants from the water to the land may have occurred more than once and in more than one group. However this may be, we have numerous cases in which members of purely terrestrial groups have returned to the water. All of our aquatic flowering plants show their terrestrial origin both in their relationships and in the fact that they expose their flowers above water, where fertilization is able to take place by the complex process of pollination which, more than any other performance or structure, was the thing that made terrestrial existence possible.

Although ferns still depend upon water as the medium for the transfer of sperm to egg, this act may be per-

[No. 2 of the JOURNAL 8: 33-64. Plate 3 was issued Aug. 6, 1918.]

formed with a scanty and transitory supply of water. So far as all the vegetative functions of root and leaf are concerned, the ferns have developed capabilities for living in moderately dry places as well as in extremely arid situations in company with cacti and thorny leafless shrubs. Just one family of ferns, the *Hymenophyllaceae*, have retained or acquired characteristics which make abundant water just as essential to the every-day vegetative processes of their leaves as it is to the sperms at the critical moment of fertilization. A microscopic examination of the leaves of filmy ferns would reveal the nature of their water requirements even if it were not possible to observe the plants in their natural habitats. Their delicate fronds are found to be only one cell in thickness. There is no upper or lower epidermis, no central tissue traversed by water vessels and honeycombed by intercellular air spaces, and there are no stomata to connect internal air cavities with the outside. All these features of the normal aerial leaf are replaced by a structure as simple as that of the smaller algae. The frond of the filmy ferns is, of course, provided with vessels, and they branch to each pinnule, but there are often as many as fifteen cells between the vein and the margin of the pinnule. It is plain that such leaves depend little upon the water that is conveyed to them by the vessels and rely largely upon their direct contact with a surface film of water.

There are relatively few localities in the world where the climatic conditions are favorable to the existence of plants which demand a sustained supply of atmospheric water. The mountainous tropical islands of the world offer these conditions, and so do the most moist elevations of continental mountains at low latitudes. During the course of three extended visits to Jamaica the writer has had an opportunity to observe and study the filmy ferns in one of the localities where they reach

a splendid development in number of species and wealth of individuals. The exacting moisture requirements of these plants are met in the shady floor of the lowland forests, while in the rainy fog-filled forests of the mountains the moisture is great enough to permit filmy ferns to grow above the floor of the forest both as climbers and as epiphytes. Among the Jamaican *Hymenophyllaceae* we find a diversity of habit, structure and habitat, in spite of the specialized character of the group. A set of 26 species communicated to the writer by Prof. Giesenhagen, from Ceylon and Java, show no such structural variety, and give no hint of such diversity of habitat as do the Jamaican plants under consideration. Forty-nine species of filmy ferns have been described from Jamaican material, but some of these are extremely rare, while others are of doubtful validity. The writer was able to find only 33 species, 18 of *Trichomanes* and 15 of *Hymenophyllum*.

At the lowest elevations filmy ferns are to be sought on shaded rocks near waterfalls and on the trunks of trees near the ground in deep shade. Most of the forms found below 2000 feet have very small and relatively simple fronds. One of the simplest of these is *Trichomanes sphenoides*, which has nearly circular sessile fronds, seldom exceeding $^1_2$ inch in diameter. *Trichomanes reptans*, *T. polypodioides*, and *T. pusillum* belong to this simple type, while *T. muscoideum* has longer fronds, simple or pinnatifid, resembling those of our own *T. petersii* of Georgia and Alabama.

A very common type of *Trichomanes*, which is closely like several species of *Hymenophyllum*, may conveniently be alluded to as the "generalized type." It has bipinnate, stipitate, glabrous fronds, in which the ultimate segments are of a uniform width of about one-sixteenth of an inch. This type is erect in growth, may be terrestrial or epiphytic, and has fronds from

2 to 6 inches in length. *T. Krausii* may be regarded as a transition from the simple type to the generalized. These two types hold sway from 1000 to 4000 feet in elevation, the latter being represented by *T. pyxidiferum*, *T. arbuscula*, *H. polyanthos*, *H. tunbridgense*, *H. jucoides*, and *H. catherinae*. The character of the frond diverges from the generalized type toward both a finer and a coarser segmentation. *H. axillare* and *H. crispum* are close to the generalized type but rather finely dissected, the ultimate segments of the latter being elaborately frilled. *T. tenerum* has narrow elongated fronds with very narrow segments, and grows only as a pendent epiphyte on the trunks of tree ferns. The most finely dissected of all *Trichomanes* is *T. trichoideum*, which has fronds from 2 to 3 inches in length, with fine capillary segments less than $\frac{1}{32}$ inch in diameter. One of the most striking sights of the rain-forest is a tree-fern trunk covered with an airy mat of *Trichomanes trichoideum*, from which glisten a thousand drops of water held in the forkings of the fronds.

The finely dissected filmy ferns are outnumbered, at least in Jamaica, by those in which the ultimate segments are wider than in the generalized type. Hardly any of these have as large areas of unbroken leaf surface as may be found in the simple types first mentioned, but all are much larger than the simple types, so that some of them have a total area of as much as 6 square inches. This is true of *T. crispum*, a simply pinnate form growing erect and stiff on the ground or as a low epiphyte. The pendent *H. asplenioides* has glabrous fronds of simple form and sinuate outline with rather large areas of solid leaf surface, and there are also large areas in *T. alatum* and *T. crinitum*.

In the majority of the more coarsely segmented fronds, and in some of the generalized type, we have a more or less pronounced hairiness. This results in a brownish

COLONY OF HYMENOPHYLLUM SERICEUM EPIPHYTIC ON A HORIZONTAL LIMB

color, sometimes in a silky lustre, and is of great importance in helping to maintain a film of water over the surface of the frond, as well as in protecting it from danger of extreme desiccation. The climbing *T. radicans* (very close to *T. boschianum* of Florida) is the largest of the Jamaican filmy ferns, its fronds sometimes measuring 15 inches in length. In every feature of habit and appearance it is closely matched by *T. scandens* which is, however, so hairy as to be distinguishable from *T. radicans* at a distance of twenty feet. There are other cases of closely similar species, which differ chiefly in one being glabrous and the other hairy, as *H. polyanthos* and *H. ciliatum*.

In the Jamaican series of ferns hairiness is much more common in *Hymenophyllum* than it is in *Trichomanes*. All of the very hairy ferns are epiphytes, and without exception their fronds are limp and pendent. In *H. sericeum* the fronds continue to grow at the apex, while the oldest pinnae blacken and die. The golden brown and densely pubescent fronds of this form are a common sight in the rain-forest, hanging from moss-covered limbs (see plate 4). The hairy pendent species are found only in the very moist mountain forests above 4000 feet. Common among them are *H. lanatum*, with small simply pinnate fronds, *H. lineare*, *H. hirsutum*, and *T. lucens*, a beautiful form in which the fronds are both hairy and crispate. The lower side of a leaning trunk may often be found with a uniform covering of *H. lanatum* or *H. lineare*, each frond pointing exactly downward, and often dry when everything else in the forest is wet.

One of the most striking things about the filmy ferns is the ability of many of the species to grow as epiphytes more than half way from the ground to the canopy of of the forest, and in other relatively dry situations. In order to realize the difference between the environ-

mental conditions on the floor of the rain-forest and in the tree tops one has only to contrast the large thin leaves of the terrestrial herbaceous plants with the small leathery leaves of the trees themselves. The shade, moisture and stillness of the forest floor form an environment well suited to such plants as the filmy ferns. It is surprising to find that they have emerged from these conditions and are to be found where the atmosphere is drier, where there is more wind and where they may even be struck at times by the rays of the sun. In spite of the hairy coatings that make it easier for them to live in relatively arid locations, they have in the main become adapted to drier conditions by the ability of their cells to lose much of their water for short periods without fatal results. This is much the same line of physiological evolution that has been followed by the desert species of *Cheilanthes* and *Notholaena*. These plants have retained all of the morphological features and most of the anatomical ones to be found in their congeners of moister climates. By means of an adaptation which is physiological rather than anatomical, these desert ferns are able to live under nearly the same conditions as the cacti, with their elaborate structural features for meeting conditions of drought.

In spite of the great diversity exhibited by the ferns of the world, we must regard them as having been conservative from an evolutionary standpoint, when we contrast them with flowering plants.

TUCSON, ARIZONA.

My Experiences with a Fern Garden

E. W. GRAVES

In 1908, while living in Clay County, Kansas, I found a colony of *Woodsia obtusa* growing on the eastern and northern exposure of what is called in Kansas a

rocky mound. In central Kansas there are several of these mounds rising some 200 ft. above the surrounding country. Under ledges of sandstone rocks I found a nice colony of the woodsia growing, the only fern I found growing wild in central Kansas, although I was told that *Cystopteris fragilis* grew in some places. I removed several plants of the woodsia to a flower garden I had planted on the north side of my house. I made a pile of stones and covered them partly with soil which I kept damp until the ferns had started to grow. They grew so well and covered the rockpile with such fluffy greenness that I decided to enlarge it and place more plants in it from the mound.

In August I made a trip to northwest Missouri to visit my old home of my boyhood days. I remembered I had seen growing in the woods the maidenhair and two other ferns, which at the time I did not know the names of. While in Missouri I hunted the woods and dug up clumps of the maidenhair and the two others which proved to be *Cystopteris fragilis* and *Athyrium filix-femina*, and by the help of a friend I found *Onoclea sensibilis*. These four ferns are the only ferns I have found in Nodaway Co., Mo., and I have searched the woods carefully during my boyhood days. I have recently read an account in the Fern Bulletin of *Osmunda cinnamomea* and I believe *O. regalis* being found in the south end of the County in later years. I took good roots of all four of the ferns from Missouri with me to Kansas and set them in my fern bed. This was my beginning of a fern garden, also my beginning of the real study of ferns.

In September of the same year my wife and I made a trip to Boulder, Col., and while exploring the mountains we came across several clumps of *Cheilanthes lanosa*, and *Pteris aquilina*, the latter being as high as my head. A few days later, while exploring Boulder

Canyon, I found several colonies of the male fern, *Dryopteris filix-mas*, growing along the water courses that flow into Boulder Canyon from the south. When I left I took with me roots of all three of the ferns with some Colorado Blue Spruce which I took back to Kansas and planted in my fernery.

In December I moved from Kansas to Long Island, Ala., taking all my ferns with me. I located on Sand Mountain plateau, the soil of which is very sandy, and is covered principally with heavy timber. To my delight I found the woods were full of ferns of different kinds. Before spring I had made out about a dozen different kinds from the dead fronds.

In the spring of 1909 I put my fern roots in a damp, shady place to keep them alive until I had built my house, and the following spring I prepared a fern bed on the north side of my house 24 ft. long and 6 ft. wide. Here I set all the ferns I had brought from the north, except *Cheilanthes lanosa* which had died.

I scoured the woods for miles around for new ferns to grow in my fern garden, and before the year was ended I had about 25 ferns growing nicely on the shady side of my house. I found my fernery was too small; I therefore enlarged it to 12 ft. wide. I soon found that some ferns require more water than others. Finally I solved that problem by building a concrete cistern or small reservoir at the west end of the fern garden which would collect the rain water from the roof of the house. Having a faucet at the lower east side I could irrigate the garden any time as the ground sloped a little to the east. I inclosed the fernery with a rock wall 3 ft. high for protection and to conserve the moisture. Each year I added new ferns which I found, and the fall of 1915 I had set about 60 different species in the fernery from several different states of the Union. But all did not grow. Of the California

ferns *Polystichum munitum* and *Woodwardia radicans* were the only ones that I could succeed in making grow. *Gymnopteris triangularis*, *Cheilanthes californica*, *Pellaea ornithopus*, and *Polypodium californicum* would not grow at all, although I received new plants several times. I received *Dryopteris filix-mas* from Idaho which did not grow, while those I brought from Colorado grew nicely and are still growing, and I was able to separate the clumps and send some to Mr. Joseph R. Mumbauer, of Pennsburg, Pa., in exchange for *Dryopteris cristata* and *D. cristata Clintoniana*. The two *Dryopteris* from Pennsylvania grew well and are still doing finely. I also received *Polystichum Lonchitis* from Mr. Mumbauer which grew very well for a year and died as Alabama was too far south for it.

In 1914 Miss F. E. Corne of Cambridge, Mass., sent me *Dryopteris Goldiana*, *Polystichum Braunii*, and *Phegopteris polypodioides* which I set in one corner of the garden and all grew off nicely for the first year. The second year *D. Goldiana* grew larger than the previous year, but *P. Braunii* showed signs of not being satisfied with the climate of Alabama. In 1916 it produced only very small fronds, and this year, 1917, it failed to appear. *Polystichum aculeatum* from California did about the same as its eastern relative—it lived two years and died. The Goldie's fern and the crested fern as well as the male fern seem to delight in the damp sandy soil of north Alabama. The long beech fern is still alive but develops only small fronds.

Along the Tennessee river, on damp limestone rocks, I found *Adiantum Capillus-Veneris* with fronds 3 ft. long. I transferred several clumps to the sandy soil of my fernery, placing pieces of limestone rocks around them, and they grew well for me.

The winter of 1916–7 was unusually cold with the thermometer several degrees below zero, and most of

the *A. Capillus-Veneris* froze out. *Cheilanthes Alabamensis* did very well by setting it among limestone rocks. *Asplenium montanum* I never succeeded in growing, although it grows only a half mile away on sandstone cliffs. I transferred it to my artificial cliffs and watered it regularly, but it always died in a few months. *A. Bradleyi* and *A. pinnatifidum* did a little better. I succeeded in getting one plant of each to adapt itself to my sandstone cliff. *Onoclea sensibilis* and *Pteris aquilina* proved to be almost a pest, and I had to cut back the roots, and pull out the fronds whenever they got out of their range. *Osmunda cinnamomea* and *O. regalis* I set near the reservoir where it was damp and they grew so large and took up so much room, that I was obliged to transfer them to a drier corner, and give *Dryopteris marginalis* and *D. spinulosa intermedia* the damp location, where they paid well with the beautiful evergreen foliage they produced.

I had one trouble to contend with which threatened some of my ferns. A whitish parasitic mold developed close to the ground on the bottom of the fronds of *Dryopteris filix-mas* and *Asplenium angustifolium*, and in a month or two the fronds of some of the plants withered and died, also killing the roots. I became alarmed for my choice ferns, but I soon discovered that a strong solution of lime-sulphur and arsenate of lead applied to the ground about the roots of the infested fern would destroy the parasite. This lime-sulphur and lead solution was what I had left from spraying my apple and peach trees, and I used it in the paste form. It saved my ferns, however, and I was glad I had stumbled onto the idea.

Two ferns I did not succeed very well in growing were *Scolopendrium vulgare* and *Trichomanes radicans*. I went to the South Pittsburgh station and dug up

several of the hart's-tongue and transplanted them in my fern garden several times but the ferns would live about a year and then die. By bringing some of the soil from the station, I did succeed in getting one to grow two years for me. The *Trichomanes* grows in its wild habitat only three miles away and I brought some home and prepared a damp shady cave for it, yet it failed to grow for me.

I derive much pleasure from my fern garden as I have many ferns growing near at hand for study, that otherwise I would have to go several miles to see.

LONG ISLAND, ALA.

An Annotated List of the Pteridophytes of Northwestern Ontario—II

O. E. JENNINGS

OPHIOGLOSSALES

25. OPHIOGLOSSUM VULGATUM L. Not collected by us but reported as collected by Dawson at the extreme southwestern part of western Ontario, at the mouth of the Rainy River, Lake of the Woods.—*Macoun.*

26. BOTRYCHIUM LUNARIA (L.) Sw. This well distributed northern species was reported by Macoun from Pic River, Lake Superior; Nipigon Bay; meadows at Camp Alexander, Nipigon River; and at various points on Lake Nipigon. Our collections were from: Heron Bay; two stations at Rossport; and Porphyry Island; all along Lake Superior.

27. BOTRYCHIUM ONONDAGENSE Underwood. Boggy trail near Grassy Lake, Thunder Cape. Reported heretofore from New York, Northern Michigan, and Montana, so that this station at Thunder Cape is probably the most northerly known.

28. BOTRYCHIUM RAMOSUM (Roth) Aschers. (*B. matricariaefolium* A. Braun; *B. neglectum* Wood.) Re-

ported from Nova Scotia to Maryland and west to South Dakota and Nebraska, also Washington and Europe, this species was recorded by Macoun from islands in Lake Nipigon and from below the railway bridge at Nipigon, and he further notes that it is "in Canada, so far as known, limited to the westward by Lake Superior." We collected it only in aspen woods on a sandy peninsula, on east side of Orient Bay, Lake Nipigon.

29. BOTRYCHIUM TERNATUM var. RUTAEFOLIUM (A. Br.) D. C. Eaton. (*B. Matricariae* Spreng.; *B. rutaceum* Sw.) With a general range from Labrador and Newfoundland and to New England and New York, also northern Michigan and Eurasia. This is evidently the plant noted by Macoun from the north shore of Lake Superior at Red Rock, Nipigon River; at Fort William; and at the mouth of the Rainy River, Lake of the Woods. We found it in a low grassy pasture, Marie Louise Lake, Thunder Cape; in aspen woods on low sandy peninsula, Orient Bay, Lake Nipigon; and on shore of Pelican Lake and on west slope of Sioux Lookout Knob, Graham. *See* Hopkins, L. S. (5a). As noted in our earlier papers this last record extends the known range considerably to the northwest.

30. BOTRYCHIUM VIRGINIANUM L. This widely distributed species is common in mesophytic woods, where well drained. Macoun reports it from Red Rock, Nipigon Bay; Thunder Bay; and up the Kaministiquia River. Our records are: Along the north shore of Lake Superior at Heron Bay; Rossport; Nipigon; Magnet Point; Silver Islet Harbor; and Fort William; while inland it was collected at Longuelac; Jellicoe; Orient Bay; Loon Lake; and Pelican Lake, at Graham.

30*a*. BOTRYCHIUM VIRGINIANUM var. GRACILE (Pursh) D. C. Eaton. In our collections once: In arbor-vitae bog one mile north of Marie Louise Lake, Thunder Cape.

30*b*. BOTRYCHIUM VIRGINIANUM var. EUROPAEUM Angstroem. Sterile leaves dissected and of a firm texture. Gulf of St. Lawrence, northern New England, and Thunder Bay District, Ontario.—Fernald & St. John. (3).

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31. OSMUNDA REGALIS L. Normally to be expected in this region, it having its northern limits in Newfoundland and Saskatchewan. The species was reported by Macoun from Round Lake, twelve miles east of the Pic River, and from Current River, north of Port Arthur. Our records are from: Granite knobs north of Loon Lake and along upper beach (boulder clay) of Jarvis Lake at Hunt.

31*a*. OSMUNDA REGALIS forma INTERRUPTA Milde. Together with the typical species at Hunt.

32. OSMUNDA CLAYTONIANA L. Mostly in low rich woods, rarely extending into bogs. Reported by Macoun for Lake Nipigon and Thunder Bay, and for Sturgeon Lake (*Bourgeau*). Our records are: Heron Bay; Rossport; Fort William; Jellicoe; Orient Bay; Ombabika Post; Loon Lake; Stanley; Watcomb; Hunt; Graham. The range likely extends farther to the north and northwest.

33. POLYPODIUM VULGARE L. Northwards ranging from Labrador and Newfoundland and to Manitoba and Kewatin, this species is not uncommon on cliffs and talus slopes north of Lake Superior. Our records are: Rossport; Nipigon; Fluor Island; Sleeping Giant Mt., Thunder Cape (alt. 1800 ft.); Mt. McKay, Fort William; granite knob, north end of Long Lake; North Ombabika Peninsula; Orient Bay; Commee, twenty miles north of Lake Nipigon; Loon Lake; Oliver Creek, Stanley; Sioux Lookout Knob, Graham.

34. PHEGOPTERIS PHEGOPTERIS (L.) Keyserling. (*P. polypodioides* Fée; *Dryopteris Phegopteris* (L.) C. Chr.)

As expected from its northern range, this species was found rather generally, our records being: Nipigon; mouth of Nipigon River; Fluor Island; Magnet Point; Silver Islet Harbor; south shore of North Ombabika Peninsula, and Orient Bay, Lake Nipigon; Rabbit Mt., and Oliver Creek, Stanley; Pelican Lake, Sioux Lookout. Rather peculiarly our collections do not include any specimens from any of the stations east of the Nipigon River or Lake Nipigon.

35. PHEGOPTERIS DRYOPTERIS (L.) Fée. (*D. Dryopteris* Britt.; *Dryopteris Linneana* C. Chr.) Extending far to the north, this species is common in rocky woods, on shaded cliffs, etc., our records including: Heron Bay; Rossport; Nipigon; Fluor Island; Magnet Point; Thunder Cape; Fort William; Longuelac; Jellicoe; Orient Bay and Ombabika Bay, Lake Nipigon; Rabbit Mt. and Oliver Creek, Stanley; Oscar; Hunt; and Sioux Lookout Knob, Graham.

36. PHEGOPTERIS ROBERTIANA (Hoffm.) A. Br. (*Dryopteris Robertiana* C. Chr.; *Phegopteris calcarea* Fée.) The general range of this species is on shaded limestone, Labrador to Manitoba and Alaska, and south to New Brunswick and Iowa, but rare. Klugh notes that for Ontario this species is reported only from Lac Seul, Rainy River District. Our specimens were found on a reddish sandstone (Keweenawan) talus slope about one-half mile southeast of Grassy Lake, Silver Islet, Thunder Cape; and on low shaded schist outcrop near mine prospect, about one mile south of Jellicoe.

37. PTERIDIUM AQUILINUM (L.) Kuhn. (*Pteris aquilina* L.) This almost cosmopolitan fern occurs abundantly on open sandy terraces, and in birch-aspen woods, more particularly west and northwest than to the north of Lake Superior. Our specimens are from: Jellicoe; Nipigon; Orient Bay; Sawyer's Bay, Thunder Cape; Fort William; Stanley; Loon Lake; Oscar; Watcomb; Sioux Lookout Knob and sandy plain, Graham.

37*a*. PTERIDIUM AQUILINUM var. PUBESCENS Underw. Our collections show this but once. Dry spruce-birch-aspen woods, Silver Islet Harbor, Thunder Cape. It is likely an ecological variety produced here under the somewhat xerophytic conditions of the thin stony soil on an old elevated lake-shore terrace.

38. CRYPTOGRAMMA ACROSTICHOIDES A. Br. A northern species ranging south to Lakes Superior and Huron and to Colorado and California. The only record I find for this region is one for Schreiber (*Campbell*).

39. CRYPTOGRAMMA STELLERI (Gmel.) Prantl. (*Pellaea gracilis* Hook.) A local species, mostly on calcareous rocks, Labrador and Alaska south to the northern United States. Macoun reports it at and below Kakabeka Falls and under cliffs at Red Rock and Nipigon. Our specimens are from: Heron Bay; Nipigon: Little Fluor Island; Surprise Lake, Silver Islet, and Tee Bay, Thunder Cape; Kakabeka Falls; few, if any, of these stations being on limestone.

40. ASPLENIUM TRICHOMANES L. This species was reported for "Red Rock, Lake Superior, and westward to the Lake of the Woods."—*Macoun*. It is certainly not common nor widely distributed in the region, for it is not in our collections and habitats likely to yield the species were examined wherever encountered.

41. ATHYRIUM THELYPTEROIDES (Michx.) Desv. (*Asplenium acrostichoides* Sw.) Ranging in rich woods from Nova Scotia and Minnesota to Georgia and Missouri. this species was reported farther north at Current River, Port Arthur.

42. ATHYRIUM ANGUSTUM (Willd.) Presl, var. RUBELLUM (Gilbert) Butters.[1] Quite variable but widely

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[1] NOTE—After the first draft of this article had been prepared, Mr. Weatherby called attention to the possibility of interesting relations of the specimens of lady ferns from the Lake Superior region to those treated by Butters in his recent studies of "The Genus Athyrium and the North American Ferns allied to Athyrium Filix-femina." Rhodora **19**: 170-207.

distributed through the whole region explored. Mixed woods, Longuelac, north end Long Lake; along rocky brook, east side Orient Bay, along glacial terrace, Orient Bay, deep woods top of rocky ridge, Orient Bay, boggy woods, North Ombabika Penninsula, all Lake Nipigon; Little Fluor Island, Porphyry Island, interior of Edward Island, coastal woods of Paps Harbor, and Silver Islet on Thunder Cape, all Lake Superior; woods east side Loon Lake; birch-spruce woods near Mission, Ft. William; moist woods near Crystal Lake, south of Ft. William; moist ravine in sand-hills 16 miles west of Ft. William; on boulder moraine south of Oscar, C. G. R.; several places in mixed woods near Sioux Lookout; moist mixed woods, Pelican Falls, Lac Seul. The fronds are mostly about 7 8 dm. high, 2 2.5 dm. wide in the middle, tapering rather rapidly both ways, the stipe 2 3 dm. long and quite scaly at base. Most of the leaves are more or less glandular puberulent, the indusia are furnished with 1–3-celled cilia, non-glandular, the spores average about 43×27μ, and the basal anterior lobe of the obtuse to sub-acuminate pinnules is considerably the longest. This variety seems to vary into the following two rather well marked types which, so far as the writer can determine, are not among those described from collections farther east or south:

Pl. 123. Sept., 1917. Accordingly, in the meager time at his disposal since then, the author has made examinations under the compound microscope of all of his specimens of lady ferns from northwestern Ontario, noting on the sheets meanwhile certain particulars as to indusia, glands, cells of the scales, etc. Apparently all of the lady ferns from this region belong to the species *angustum* (Willd.) Presl, as understood by Butters. In general it may be said that the specimens from northwestern Ontario have somewhat larger spores, the pedicels of the sporangia more frequently bear stalked glands, and the pinnules are more often or more nearly acute than Butters has found for the lady ferns of the northeastern part of North America. Comparisons with specimens in the Carnegie Museum from eastern United States and eastern Canada confirm these statements. More extended descriptions, together with illustrations, will appear later in an article to appear in the Annals of the Carnegie Museum. —O. E. J.

42*a*. ATHYRIUM ANGUSTUM var. **glanduliferum** var. nov. Closely allied to var. *rubellum*, from which it differs in that the pedicels of the sporangia are mostly furnished with a stalked colored gland, the indusia mostly have cilia of several cells in length, and the pinnules are rather more acute and tend to be spinulose-toothed. The type is from mixed woods on glacial terrace at Nipigon, O. E. and G. K. Jennings, Sept. 1, 1912. Other specimens: mixed woods at head of west fork of Jackfish Bay, Lake Superior; from mixed woods at Pelican Falls, Lac Seul; mixed woods along trail on glacial till, Sioux Lookout. The two last-mentioned specimens have the pinnules rather remote, the one from Pelican Falls having a few forked pinnae and the pinnules somewhat oblique, acute, and almost spinulose-toothed.

42*b*. ATHYRIUM ANGUSTUM var. **boreale** var. nov. The fronds are dimorphic but differ from *f. typicum* and var. *elatius* in that the fertile pinnules, especially, are much more sharply and deeply toothed and are acute rather than obtuse. The writer can not distinguish between varieties *boreale* and *glanduliferum* in some cases excepting that the one has dimorphic fronds and the other not. It appears quite likely that the dimorphic varieties owe this character simply to their more exposed habitat. The type was collected along the sunny muskeg margin of Little Bear River, Oscar, C. G. R., O. E. and G. K. Jennings, Sept. 5, 1917. Another fine specimen was collected on burned-over boulder till north of Lake Nipigon, near Ombabika Post. Also mixed woods on boulder moraine, Watcomb, C. G. R.; spruce muskeg near Jellicoe, east of Lake Nipigon; and at several places in the sand hills about 17 miles west of Ft. William. It will be noticed that the variety *boreale* occurs in both physically xerophytic habitats (boulder-moraine, sand-hill, burn) and in boggy situations.

43. DRYOPTERIS THELYPTERIS (L.) A. Gray. (*Aspidium Thelypteris* Sw.) Ranging in marshes and wet woods from New Brunswick and Manitoba south to the Gulf States, this species reaches, for this longitude, its northernmost range, at least as to known records, around Lake Nipigon. Our stations for it are as follows: Longuelac, Long Lake; margin of boggy pond, Jellicoe; edge of bog at base of Mt. McKay, Fort William; boggy ditch, Watcomb; shore of Jarvis Lake, Hunt. As indicated in our records for some of the flowering plants, this species also possibly pinches out in the Nipigon region, appearing to the east and west of there in gradually widening areas of distribution, but keeping back away from the immediate north and more northeastern colder shores of Lake Superior.

44. DRYOPTERIS CLINTONIANA (D. C. Eaton) Dowell. (*Aspidium cristatum* var. *Clintonianum* D. C. Eaton.) This species reaches its northwestern limit in Ontario, extending from there to Wisconsin, Maine, and North Carolina. We did not collect it, but it was reported by Macoun from Flat Rock Portage, south end of Lake Nipigon, far to the north of its normal range.

45. DRYOPTERIS MARGINALIS (L.) A. Gray. (*Aspidium marginale* Sw.) Nova Scotia and British Columbia south to Georgia and Oklahoma, probably reaching for this longitude its northern limit in the station reported by Macoun at Split Rock Portage, on the northern part of the Nipigon River. We did not succeed in finding this species at any of our localities.

46. DRYOPTERIS FRAGRANS (L.) Schott. (*Aspidium fragrans* Sw.) A northern species, reaching Greenland and Alaska and south to a number of the northern states, from Maine to Minnesota. North of Lake Superior it is one of the most characteristic plants of exposed cliffs and particularly of talus slopes. Macoun reports it from Pie Island; Red Rock; Nipigon River;

and Lake Nipigon; while our specimens are from: Heron Bay; Jackfish; Nipigon; Little Fluor Island; Paps Harbor, Black Bay Peninsula; Sleeping Giant Mt., Thunder Cape; Mt. McKay, Fort William; Virgin Falls; Orient Bay, and North Ombabika Peninsula, Lake Nipigon; slate cliff near Stanley; Sioux Lookout Knob, Graham.

47. DRYOPTERIS CRISTATA (L.) Gray. (*Aspidium cristatum* Sw.) Although along its northern limit reaching Newfoundland and Saskatchewan, this species is not common in northwestern Ontario. Our stations for it are as follows: Orient Bay, Lake Nipigon, in marshy Myrica bog and along monntain rivulet; in alder thicket along stream south of Oscar; and on hummocks with bog birch at south end of Pelican Lake, Sioux Lookout.

48. DRYOPTERIS RIGIDA (Hoffm.) Underw., var. ARGUTA (Kaulf.) Underw. Boggy woods near lighthouse, Porphyry Island, Lake Superior. This is very close to the European *D. rigida* (see Jennings, O. E., Am. Fern Journ. **4:** 72. 1914, Hopkins comments on this specimen).

49. DRYOPTERIS SPINULOSA (Muell.) Kuntze. (*Aspidium spinulosum* Sw.) Newfoundland and Labrador to Virginia, British Columbia and Idaho, and common in the Lake Superior region in mesophytie woods and thickets. Our stations for it are as follows: Heron Bay; Rossport; Nipigon; Little Fluor Island; Magnet Point; Edwards Island; Thunder Cape; Fort William; Jellicoe; Alexander Portage, Nipigon River; Stanley; Hunt; Sioux Lookout; and Pelican Falls, south side of Lac Seul.

50. DRYOPTERIS INTERMEDIA (Muhl.) Gray. (*Aspidium spinulosum* var. *intermedium* D. C. Eaton.) Common in moist woods from Newfoundland to Wisconsin and south to North Carolina and Tennessee.

this species is not as common in the Lake Superior region as is *spinulosa*. Our stations for it are: Crystal Lake, south of Fort William; Thunder Cape; Conmee, twenty miles north of Nipigon; Virgin Falls and Sand Point, south end of Lake Nipigon; Ombabika Post, north end of Lake Nipigon; and south end of Pelican Lake, Sioux Lookout.

51. DRYOPTERIS DILATATA (Hoffm.) Gray. (*Aspidium spinulosum* var. *dilatatum* Hook.; *D. spinulosa* var. *dilatata* Underw.) This circumboreal species extends south to North Carolina, Tennessee, Idaho and California. Macoun says of it: "Not very common in Ontario except about Lake Superior." Our collections of it are from: Heron Bay; Jackfish; Nipigon; Porphyry Island; Tee Bay, Thunder Cape; and Fort William. We did not find it at any of our localities away from the immediate shores of Lake Superior, and it is likely that this shore constitutes its northern boundary.

51*a*. DRYOPTERIS DILATATA forma ANADENIA (Robinson) Hopkins. (*D. spinulosa* var. *americana* Fernald; *Aspidium spinulosum* var. *dilatatum* forma *anadenium* Robinson.) Differing from *dilatata* in having smooth indusia. Found by us at two stations: Moist coniferous woods, Porphyry Island; and along trail in wet woods near Tee Bay, Thunder Cape.

52. FILIX BULBIFERA (L.) Underw. (*Cystopteris bulbifera* Bernh.) On wet rocks and in ravines this species extends south from Newfoundland and Manitoba to Georgia and Arkansas. It is reported but twice from the Lake Superior region, based on our collection of Aug. 15, 1912, on moss-covered crumbling rock in arbor-vitae swamp, Silver Islet Harbor, Thunder Cape; and on face of slate cliff, Oliver Creek, three miles southeast of Stanley. Macoun says of this fern: "Very abundant in Ontario as far west as the Bruce Peninsula."

but he does not specify any localities farther west in Ontario. It is likely that the northern limit of its range does not reach up around the north shore of Lake Superior.

53. FILIX FRAGILIS (L.) Underw. (*Cystopteris fragilis* Bernh.) This practically cosmopolitan species is rather common on cliffs and shaded rocks almost throughout the region visited. Our records for it are as follows: Heron Bay; Nipigon; Little Fluor Island; Paps Harbor, Black Bay Peninsula; Silver Islet, Thunder Cape; Mt. McKay, Fort William; Orient Bay and North Ombabika Peninsula, Lake Nipigon; slate cliff, Oliver Creek, Stanley; and slope of Sioux Lookout Knob, Graham.

53*a*. FILIX FRAGILIS var. MAGNA-SORA Clute. Along sandstone talus slope, one and one-half miles west of Silver Islet, Thunder Cape, Aug. 4, 1912.

54. FILIX MONTANA (Lam.) Underw. (*Cystopteris montana* Bernh.) Ranging from Labrador and Quebec to Alaska and British Columbia, the northern limit of this species appears to swing down to Lake Superior, based on Macoun's report of it at Current River, Port Arthur.

55. WOODSIA ILVENSIS (L.) R. Br. Ranging from arctic regions south to the northern part of the United States, this species is fairly common on cliffs and talus slopes, often in company with *Dryopteris fragrans*. Macoun notes that it is "very abundant and luxuriant west and northwest of Lake Superior." We collected it from the following stations: Rossport; Nipigon; Fluor Island; Paps Harbor, Black Bay Peninsula; Silver Islet, Thunder Cape; Mt. McKay, Fort William; Jellicoe; Virgin Falls, Orient Bay, and North Ombabika Peninsula, Lake Nipigon; Loon Lake; Oscar; and Sioux Lookout Knob, Graham.

56. WOODSIA ALPINA (Bolt.) S. F. Gray. This rare fern, with a range from arctic America to Maine, New

York, and western Ontario, was reported by Macoun as occurring on mountain masses along the north shore of Lake Superior, west of Nipigon Bay, and on cliffs of Jackfish Island, Lake Superior. We found it as follows: on coastal cliffs at Fork Bay and on ledges around Surprise Lake, Thunder Cape; and on shaded ledges of Beaver Lake, St. Ignace Island, Lake Superior.

57. WOODSIA GLABELLA R. Br. Like W. *alpina*, this species extends south from the arctic regions, reaching in this case northern New England and New York, and British Columbia. Macoun reports it for the Kakabeka Falls; Red Rock, Nipigon Bay; and on trap up the Nipigon River. Our stations for it are: face of Nipigon Palisades; mica-schist cliff and on lake-cliff, Heron Bay; and cliff, Little Fluor Island, Lake Superior. The north shore of Lake Superior may probably be regarded as the southern limit of the species in that longitude.

58. WOODSIA OREGANA D. C. Eaton. With one station at Bic, in eastern Quebec, this species ranges from the Blackwater River, southeastern Lake Nipigon, (*Macoun*) to Lake Athabasca, British Columbia, and south to northern Michigan, Oklahoma, and Arizona. We did not succeed in finding it at our stations.

59. ONOCLEA SENSIBILIS L. Ranging from Newfoundland to Saskatchewan and south to the Gulf States and Oklahoma, this species is rather uncommon in the region covered in our work: Sugar Maple grove, Mt. McKay, Fort William; Orient Bay, Lake Nipigon; among sand-hills near Stanley; Oscar; Jarvis Lake, Hunt; and Pelican Lake, Sioux Lookout. It may be noted that none of our stations along the shore of Lake Superior east of Fort William nor east of Lake Nipigon yielded this species.

60. MATTEUCIA STRUTHIOPTERIS (L.) Todaro. (*Onoclea Struthiopteris* Hoffm.) With a range in North America from Newfoundland to Virginia and west to Iowa and British Columbia, the northern limit of this species swings south to the Lake Superior region. It was found by us at Nipigon and at the bottom of a deep narrow gorge at Orient Bay, south end of Lake Nipigon, but there appear to be no other reports of its occurrence along the north shore of Lake Superiur or inland from there, excepting in the warmer valley northwest of Fort William, where Macoun reports it "five miles up the Kaministiquia River," and where we collected it along Oliver Creek, three miles southeast of Stanley, and at Kakabeka Falls. It will be interesting to know if it occurs to the north of the northeastern shore of Lake Superior.

PITTSBURGH, PA.

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Further Notes on Pellaea[1]

WILLIAM R. MAXON

The following notes relate chiefly to the distribution of several United States species of *Pellaea*. Incidentally a new name is given to the southwestern plant long known as *Pellaea aspera* (Hook.) Baker, which Christensen has renamed *Pellaea scabra*. This peculiar species was first described under *Cheilanthes* by Hooker, to which genus it clearly belongs, rather than to *Pellaea*, regarding *Pellaea* in substantially the same sense in which it was founded by Link.

PELLAEA COMPACTA (DAVENP.) MAXON.—In a recent paper[2] dealing chiefly with the taxonomy of the southwestern ferns usually associated under the name *Pellaea Wrightiana* Hook. the writer has taken up the name *Pellaea mucronata* D. C. Eaton for the common California plant long passing as *P. ornithopus* Hook. and has recognized two species in the Mexican border region, *P. Wrightiana* Hook. and *P. longimucronata* Hook., distinguished by characters which appear to hold invariably. Incidentally a new species, *Pellaea compacta*, is described from southern California, its relationship being with *P. mucronata*. Although *P. compacta* appears to be rare in herbaria it is said by Mr. S. B. Parish[3] to be "frequent in the San Bernardino and San Jacinto Mts., growing in stony soil on dry slopes at 6000 to 8000 ft.," and to have been collected also in the Providence Mountains of the Mojave Desert. Its relationship to *P. mucronata*, with which it was supposed to grow, is clear; but Mr. Parish, writing recently from San Bernardino, remarks that there is a "marked limitation in the distribution of this fern and *P. mucronata* in

[1] Published with the permission of the Secretary of the Smithsonian Institution.

[2] Proc. Biol. Soc. Washington **30:** 179–184. 1917.

[3] Fern Bull. **12:** 8. 1904.

this region." He states that *P. mucronata* is there confined strictly to the Upper Sonoran Zone and to that part of it which he has called the Lower Chaparral Zone, and that in these limits it is exceedingly abundant. He adds: "I noted *P. compacta* as belonging to the Canadian Zone; but to be more exact, it may be said to occur also in the upper part of the Upper Transition. Its occurrence is frequent, but it is by no means so common and abundant as the other species. So far as my observation extends there is a geographical hiatus between the two species in which no *Pellaea* occurs. I have never seen any material that I could regard as intermediate." *Pellaea compacta* was described originally as a variety of *P. Wrightiana*, to which species and *P. longimucronata* it is more remotely related.

PELLAEA BRIDGESII HOOK.—This species, which seems to have been known only from California, occurs also in Idaho. Specimens at hand were collected by Mr. E. Grandjean (no. 96) in the autumn of 1913 in the Boise National Forest, on rocky hillsides of the divide between the Salmon and Payette Rivers. In California this species ranges in the Sierra Nevada from Nevada County southward to Mineral King, Tulare County (*Coville & Funston* 1418), at altitudes of 1650 to at least 3300 meters.

PELLAEA BREWERI D. C. EATON.—The distribution of *P. Breweri* has recently been stated by Butters[4] as "from the Sierra Nevada Mountains, through the basin ranges of Nevada and Utah, to the Blue Mountains of Oregon, central Idaho, and western Wyoming." This range may be definitely extended to include Washington, on the basis of a single collection in the National Herbarium (Yakima region, 1883, *Tweedy* 20). There are, in addition, published records for New Mexico and Montana, which the writer has been at some pains

[4] Amer. Fern Journ. 7: 86. 1917.

to clear up. Thus, as late as 1893, Eaton, in the Botany of the Death Valley Expedition,[5] indicates the range as "extending to the Belt Mountains of Montana, and to New Mexico at Loma, on the Rio Grande." Both the Montana and the "New Mexico" specimens, in the Eaton Herbarium, have been examined by the writer through the courtesy of Prof. Alexander W. Evans, and both belong to the puzzling western aggregate associated with *P. glabella* in a varietal sense by Professor Butters. They are very clearly not *P. Breweri*. The Montana specimen was collected in the Belt Mountains by Newberry in 1884.

The "Loma" specimens actually come from southern Colorado, the rather confused history being as follows: In Ferns of the Southwest[6] Eaton cited *P. Breweri* as from New Mexico (*Loew*) and as having been collected "near Loma in southern Colorado, *Dr. Rothrock* .....near the headwaters of the Rio Grande." In Ferns of North America[7] Eaton again mentioned small specimens collected "near Loma in Colorado, near the Rio Grande," here ascribing Loew as the collector. The specimens in the Eaton Herbarium are marked in Eaton's hand as collected in New Mexico, by Loew, with the locality "Loma, on Rio Grande" written in later. Aside from the foregoing there is no record of the occurrence of either *P. Breweri* or *P. glabella* in Colorado; Rydberg[8] merely lists the former as "reported from Colorado, but exact locality not given." There are at present two localities in Colorado named Loma, neither of them that of the Wheeler Survey. The particular Loma mentioned is apparently a former Mexican settlement shown on old survey maps under this name, located on the north side of the Rio Grande

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[4] Contr. U. S. Nat. Herb. 4: 227. 1893.
[5] In Rept. U. S. Geogr. Surv. W. 100th Merid. 6: 319. 1879.
[7] 1: 331–333. 1879.
[8] Fl. Colorado, 4. 1906.

opposite the present town of Del Norte, in Rio Grande County, Colorado, 30 or 40 miles from the source of the river. In definitely excluding New Mexico and Colorado from the known range of *P. Breweri*, therefore, Colorado is added to the range of *P. glabella*. Whether the collection was by Rothrock or by Loew is uncertain.

A departure from the characteristic 2-lobed or "mitten-shaped" form of the pinnae is mentioned by Eaton in the case of the "Loma" specimen (*P. glabella* var.) erroneously referred by him to *P. Breweri*, the larger pinnae having three or four distinct lobes. Undoubted *Pellaea Breweri*, also, occasionally has a similar development, as shown by a small specimen from Cottonwood Canyon, Utah, in the Eaton Herbarium, and by young fronds in the National Herbarium collected on the Death Valley Expedition, at the north base of Telescope Peak, Panamint Mountains, California, June 23, 1891, by Coville and Funston (no. 2028). Some of the latter are even more subdivided, the proximal basal segment of the larger pinnae being free and itself bilobed. The plants seem otherwise not to differ from ordinary states of *P. Breweri*.

The following collections, chiefly from the interior regions, are additional to those cited by Butters. All are in the National Herbarium:

WYOMING: Special locality wanting, Sept. 4, 1893, *Rose* 325.

IDAHO: Mountains at head of Redfish Lake, alt. 2550–3000 meters, Aug. 22, 1895, *Evermann* 438; Bonanza, Custer Co., alt. 2250 meters, July 25, 1916, *Macbride & Payson* 3433; Smoky Mountains, Blaine Co., alt. 2700 meters, Aug. 13, 1916, *Macbride & Payson* 3758; Blackfoot Canyon, Caribou Forest, Bannock County, alt. 1900–2100 meters, Sept., 1913, *Eggleston* 9995.

UTAH: Mount Nebo, Aug. 15, 1905, *Rydberg & Carlton* 7742; Ogden Canyon, Ogden, Aug. 19, 1913, *A. E. Hitchcock* 1440; locality wanting, 1875, *Parry* 94.

OREGON: Gayhart Buttes, alt. 2200 meters, Aug. 9, 1896, *Coville & Leiberg* 301; locality wanting, 1883, *Cusick* 516.

WASHINGTON: Yakima region, 1883, *Tweedy* 20.

PELLAEA ATROPURPUREA (L.) LINK.—An extension of range is noted in specimens of the Biltmore Herbarium, recently presented to the National Museum. These were collected at Crestview, Walton County, Florida, in crevices of limestone rock, Sept. 26, 1899, *Biltmore Herb.* 755a. This species has been collected frequently in Georgia, but has not hitherto been known from Florida.

PELLAEA ASPERA (HOOK.) BAKER.—This is one of the very rarest and least known of the Mexican Border ferns. It was described originally by Hooker, as *Cheilanthes aspera*, on Texas specimens collected in 1849 by Charles Wright, and has since been collected in only a few localities. In its specific characters it is highly individual, the most conspicuous peculiarity being its strongly scabrous upper surfaces. The roughness is due to the presence of rather numerous short, white, stiff hairs which arise at intervals from inflated conical bases in groups of two or three, following the course of the immersed veins. The leaf tissue of the living plant is presumably delicate, for the segments are transversely waved toward the edge, the tissue apparently shrinking between the veins, in drying, and about the base of the hairs. The ridges are thus minutely tuberculate from the presence of the elevated, wholly persistent, rigid hair-bases. The hairs increase in size and number toward the enlarged tips of the veins, but do not quite reach the whitish, re-

curved margin of the segments. The margins are herbaceous and denticulate-ciliolate.

The generic position of this plant has been regarded as doubtful; but in habit and most essential characters, such as vestiture and the definitely thickened vein-ends, it belongs to *Cheilanthes* rather than *Pellaea* and may accordingly be transferred to that genus as **C. horridula,**[9] the new species name being required under *Cheilanthes*.

The following specimens are in the National Herbarium:

TEXAS:[10] Crevices of rocks on hills, Turkey Creek, June 25, 1849, *Wright* 824 (type collection); high stony hills of the Pecos, June 1, 1851, *Wright* 2127; near mouth of the Rio Pecos, Oct., 1883, *Havard;* Sanderson, Pecos Co., Sept. 29, 1911, *Wooton*.

NEW MEXICO: "Near the Copper Mines," Grant Co., *Mex. Bound. Survey* 1581 in part.[11]

ARIZONA: "Head of the Rio San Pedro, Nov. 5, 1850," *Mex. Bound. Survey* 1581 in part.

CHIHUAHUA: Rocky hills near Chihuahua, Oct. 31, 1885, *Pringle* 447 (4 sheets).

COAHUILA: Mountains north of Monclova, Sept., 1880, *Palmer* 1422 (2 sheets).

DURANGO: "El Mundo Hill," Lerdo, alt. 1650 meters, Nov. 25, 1911, *Chaffey* 58 in part.

WASHINGTON, D. C.

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[9] **Cheilanthes horridula** Maxon, nom. nov.

Cheilanthes aspera Hook. Sp. Fil. **2:** 111. *pl. 105*. A. 1852, not Kaulf 1831.

Pellaea aspera Baker in Hook. & Baker, Syn. Fil. 148. 1867.

Pellaea scabra C. Chr. Ind Fil 172. 1905, not *Cheilanthes scabra* Karst. 1854.

[10] For locality data of *Wright* 824 and 2127 the writer is indebted to Mr. C. A. Weatherby, who has looked up the records in the MS list of Wright's 1849 and 1851 collections at the Gray Herbarium.

[11] Eaton's record of this number in Torrey, U. S. & Mex. Bound. Bot. 234. 1859 is as follows: "Lower Rio Grande, *Schott;* near the Copper Mines and along the San Pedro, *Bigelow*." The National Herbarium

Notes and News

In a brief note,[1] Elizabeth Dorothy Wuist records the development of apogamous prothallia from spores of *Phegopteris polypodioides*, *Osmunda cinnamomea* and *O. Claytoniana*, grown on various nutrient solutions. In all three species the apogamous embryos developed either from slight swellings of the prothallial tissue, forming eventually dome-shaped cellular masses, from which the young plant grew, or from cylindrical outgrowths from the notch of the prothallium, bearing at their apices cellular masses, from which the embryo was formed.

American Fern Society

Word has been received of the death of Mr. Charles Keene Dodge, a member of the Society since 1893, the year of its formation. Mr. Dodge was born on a farm near Jackson, Mich., April 26, 1844. He attended the University of Michigan and after his graduation in 1870, taught school for four years and then studied law. In 1875 he settled in Port Huron, Mich., where he has lived ever since. In 1893 he gave up his law practice to take the position of Deputy U. S. Customs Inspector—largely, we are told, because this position would give him more time for the pursuit of botany. He held it until his death.

[1] Bot. Gaz. **64**: 435–437. Nov., 1917.

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sheet contains three separate plants, without special locality data, but very probably from the three localities mentioned. The first locality is, of course, in Texas or an adjacent part of Mexico; the second is Wright's well known locality in Grant County, New Mexico, and the only New Mexican station for this fern; the third is in Arizona, and possibly the only Arizona locality known. The data "Head of Rio San Pedro, Nov. 5, 1850, *Bigelow*," are taken by Mr. Weatherby from a specimen in the Gray Herbarium. This locality is in the southern part of Arizona, on the east side of the Catalina Mountains.

Mr. Dodge was an earnest and industrious collector and student of the local flora of his region. His specimens are probably to be found in most of the large herbaria of the United States, and he was always ready to lend, from his own large collection, material which botanists working up special groups wished to examine. He published a considerable number of local floras and other papers dealing with the plants of Michigan and adjacent Ontario.

The Secretary has heard of two more of our members who are now in the army—Mr. Ellsworth P. Killip and Mr. Milton E. Woodams, both serving with machine-gun units of the National Army.

The members of the nominating committee are: C. H. Bissell, chairman; R. A. Ware and Miss Nellie Mirick.

Miss M. A. Marshall, Still River, Mass., has been appointed Judge of Elections.

New member:

Beckwith, Miss Florence, 255 University Ave., Rochester, N.Y.

House, Dr. H. D., State Botanist, Education Building, Albany, N.Y.

Change of address:

Durand, Dr. E. J., Pillsbury Hall, Univ. of Minn., Minneapolis, Minn.

American Fern Journal

Vol. 8 OCTOBER–DECEMBER, 1918 No 4.

The Fern Flora of Northeastern Iowa[1]

T. J. FITZPATRICK

The writer spent the months of June and July, 1895, in this portion of Iowa, camping and traveling along the Oneota or Upper Iowa and the Mississippi rivers. While all available botanical specimens were collected, special attention was given to the ferns, and a good representation was secured. In the following year Mr. Herbert Goddard, then a resident of Decorah, Winneshiek County, sent the writer a collection he had secured in the vicinity of his home. During the years from 1899 to 1902 the writer had a valued correspondent, Mr. Ellison Orr, who resided at Waukon, Allamakee County. Mr. Orr's fine specimens were accompanied by many valuable critical notes. From these sources of information the following article has been written.

This portion of Iowa possesses for Iowans a peculiarly quiet scenic beauty, being the most broken or rolling, and the most wooded of any portion of the State. Iowa as a whole is a broad expanse of gently undulating prairie, with the characteristic flora modified by civilization. In northeastern Iowa there are more high hills, rugged cliffs, deep ravines, perennial springs, piny woods, and rapid flowing streams than are to be found in any other region of the same size in the State. Being the least affected by cultivation, many natural park sites are available, some of which are destined to be utilized in the near future.

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[1] Contributions from the Department of Botany, University of Nebraska, No. 22

[2] No. 3 of the JOURNAL (8: 65–96, Plate 4) was issued October 8, 1918.]

In the region under consideration, Winneshiek and Allamakee Counties are bounded on the north by Minnesota; and Allamakee, Clayton and Dubuque Counties lie along the west bank of the Mississippi River. Most of the region lies in what is known as the driftless area, that is, an area of rounded hills with no drift mantle or debris, while all the surrounding region is heavily drift covered.

Geologically this region, generally speaking, is of the oldest in the State. The Saint Croix sandstone of the Cambrian era, the Oneota limestone, the Saint Peter sandstone, the Trenton limestone, the Galena limestone and the Maquoketa shales are successively exposed from the state line southward.

A locality with so varied a topography readily gives many favorite habitats for ferns. Almost every fern native of Iowa may be found and many of them are quite frequent in occurrence.

OPHIOGLOSSACEAE

BOTRYCHIUM VIRGINIANUM (L.) Swartz. Rich woods; frequent; Winneshiek, Allamakee, Clayton, and Dubuque Counties.

OSMUNDACEAE

OSMUNDA CLAYTONIANA L. Rich woods; common; Winneshiek, Allamakee, Clayton, and Dubuque Counties.

POLYPODIACEAE

ONOCLEA SENSIBILIS L. In rich moist soil; frequent; Winneshiek, Allamakee, Clayton, and Dubuque Counties. This species is very abundant on the high islands in the Mississippi River, east of Waukon Junction, Iowa; there is also a small colony in a springy slough near Postville, Iowa.

ONOCLEA STRUTHIOPTERIS (L.) Hoffm. (*Matteuccia struthiopteris* (L.) Todaro.) My specimen was collected

in Allamakee County by Mr. Ellison Orr, who reports that the species is abundant in rich soil at the foot of bluffs along the Mississippi River at Waukon Junction and north of Lansing, Iowa, also north of McGregor and near Bulah, Clayton County; there are also occasional plants along Village creek and Oneota river, in Allamakee County, in suitable localities. The species has also been collected in Dubuque County.

Woodsia obtusa (Spreng.) Torrey. My specimen from Allamakee County was collected by Mr. Orr, who found it growing on great fragments of rock at the foot of a bluff one-half mile east of Ion, Iowa, on Yellow river. The species has also been found in Winneshiek County.

Woodsia ilvensis (L.) R. Br. Professor B. Shimek reports finding this species in two localities northeast from Hesper, Winneshiek County, Iowa.

Woodsia scopulina D. C. Eaton. In 1900 Mr. Herbert Goddard, of Decorah, Iowa, sent me a specimen found nearby, which I at the time reluctantly referred here, but on further examination I am inclined to consider it the preceding species.

Cystopteris fragilis (L.) Bernh. (*Filix fragilis* (L.) Underwood.) Rich calcareous or moist soil in woods; common; Winneshiek, Allamakee, Clayton, and Dubuque Counties.

Cystopteris bulbifera (L.) Bernh. (*Filix bulbifera* (L.) Underwood.) Rich calcareous soil; common; Winneshiek, Allamakee, Clayton, and Dubuque Counties.

Aspidium goldianum Hook. (*Dryopteris goldiana* (Hook.) A. Gray.) Winneshiek and Allamakee Counties, in rich woodsy soil in timber growing on bluff sides near Decorah and south of Waukon Junction and north of Lansing, and other similar localities. The species is rather rare even in localities where found.

Aspidium thelypteris (L.) Sw. (*Dryopteris thelypteris* (L.) A. Gray.) Winneshiek and Allamakee Coun-

ties; wet soil; frequent. This species is common on marshy islands of the Mississippi River and occasionally in sloughs in this region. I also have a specimen from the neighboring county of Fayette.

ASPIDIUM MARGINALE (L.) Sw. (*Dryopteris marginalis* (L.) A. Gray.) The only specimen I have from this region is from Allamakee County, sent to me by Mr. Ellison Orr, who writes: "Growing on a timbered, shady, steep north slope of a sandstone bluff capped by limestone, about seven miles northeast of Postville on Yellow river, only one colony—a fine one—discovered so far in the county." This is a rare fern for Iowa.

PHEGOPTERIS DRYOPTERIS (L.) Fée. (*Dryopteris dryopteris* (L.) Britton.) I have specimens which I have referred here from Winneshiek and Allamakee Counties. The habitat is moist, rocky woods.

PHEGOPTERIS ROBERTIANA (Hoffm.) A. Br. (*Phegopteris calcarea* Fée. *Dryopteris robertiana* (Hoffm.) C. Chr.) This species closely simulates the preceding, of which it may be a variety or only a form. Specimens are at hand from Winneshiek and Allamakee Counties. The specimens from Allamakee County are from Mr. Orr, who writes: "Very abundant where collected on mossy, partly shaded, rocky talus at foot of, and on north side of high and steep bluff along south side of Yellow river, the only station I know in Allamakee County."

PHEGOPTERIS HEXAGONOPTERA (Michx.) Fée. (*Dryopteris hexagonoptera* (Michx.) C. Chr.) Allamakee County, my specimen is from Mr. Orr, who reports: "A few scattering plants on north side of wooded bluff, Waukon Junction, Iowa."

CAMPTOSORUS RHIZOPHYLLUS (L.) Link. Winneshiek, Allamakee, Clayton, and Dubuque Counties; rocky limestone soil in woods; frequent; often growing on the

tops of large detached boulders at the bottom of deep, shaded ravines.

ASPLENIUM ANGUSTIFOLIUM Michx. (*Asplenium pycnocarpon* Spreng.) Allamakee County; in rich shaded wood soil on slopes and at the foot of timbered bluffs at Waukon Junction and at Lansing, Iowa; infrequent or rare; seemingly preferring the bluffs near the Mississippi River. I have also a specimen from Jackson County.

ASPLENIUM FILIX-FOEMINA (L.) Bernh. (*Athyrium filix-foemina* (L.) Roth). Winneshiek, Allamakee, Clayton, and Dubuque Counties. Woods and thickets, the most abundant fern and very common throughout this region, as well as all the portions of the State.

ASPLENIUM ACROSTICHOIDES Sw. (*Asplenium thelypteroides* Michx. *Athyrium thelypteroides* (Michx.) Desv.) Allamakee and Dubuque Counties. Mr. Orr writes: "Two small colonies near Waukon, one at Lansing, probably rare in the county."

ADIANTUM PEDATUM L. Winneshiek, Allamakee, Clayton, and Dubuque Counties; rich woods; common.

PTERIS AQUILINA L. (*Pteridium aquilinum* (L.) Kuhn.) Winneshiek, Allamakee, Clayton, and Dubuque Counties; quite common. The habitat is medium dry or moist soil along hillsides covered with thickets or woods.

PELLAEA ATROPURPUREA (L.) Link. Winneshiek, Allamakee, Clayton, and Dubuque Counties. Found also in the neighboring counties of Fayette and Delaware. This species prefers limestone cliffs, but grows on sandstone. Mr. Orr notes: "Abundant throughout Allamakee County on all limestone rocks. Shows most luxuriantly where rocks are moist and shaded. Grows abundantly in rock cuts of C. M. & St. P. R. R. west of McGregor. I have seen fine specimens near Harpers Ferry, Iowa."

PELLAEA STELLERI (S. G. Gmel.) Watt. (*Pellaea gracilis* (Michx.) Hook. *Cryptogramma stelleri* (Gmel.) Prantl.) Winneshiek, Allamakee, Clayton, and Dubuque Counties. Frequent to common in limestone or sandstone cliffs. Mr. Orr writes for Allamakee County: "very abundant in moist soil in pockets and crevices of a ledge of St. Peter sandstone, three miles east of Waukon, Iowa, also found at stations near Myron on Yellow river, growing in moist soil in crevices of Trenton limestone."

CHEILANTHES LANUGINOSA Nutt. (*C. féei* Moore. *C. gracilis* (Fée) Mett.) Winneshiek, Allamakee, Clayton, and Dubuque Counties; exposed dry ledges of Oneota limestone, common. This species is abundant on the face of rocky cliffs of a prominent hill in Allamakee County known locally as "Big Elephant."

POLYPODIUM VULGARE L. Allamakee and Clayton Counties. Cliffs, frequent, even common on shaded outcrops of St. Peter sandstone in Allamakee County and on the pictured rocks at McGregor, Clayton County. The species has also been reported from Winneshiek County.

SALVINIACEAE

AZOLLA CAROLINIANA Willd. This species is found floating in quiet waters. It was found by Miss King in Allamakee County (Plant World, **5:** 225). I have specimens from Muscatine and Louisa Counties, from bayous along the Mississippi River, farther south than the region under consideration. I also have specimens collected by J. P. Anderson from Lake Wabonsi in Fremont County, the southwest corner county of the state. This species is rarely collected, but it is probably more frequent than collections indicate, being overlooked.

EQUISETACEAE

EQUISETUM ARVENSE L. Moist, sandy or clay soils, waysides and waste places, common; Winneshiek, Allamakee, Clayton, and Dubuque Counties. This species is extremely abundant on islands of the Mississippi River, often growing in the water.

EQUISETUM LAEVIGATUM A. Br. Common in moist, clayey soil, along waysides and banks; Winneshiek and Allamakee Counties.

EQUISETUM ROBUSTUM A. Br. This species has been found in Winneshiek, Clayton, Dubuque, Clinton, and Jackson Counties. It occurs frequently in moist to wet soil, along banks.

EQUISETUM HYEMALE L. Specimens from Winneshiek, Allamakee, and Dubuque Counties have been referred here.

LYCOPODIACEAE

LYCOPODIUM LUCIDULUM Michx. This species has been found in moist woods near Hesper, Winneshiek County.

SELAGINELLACEAE

SELAGINELLA RUPESTRIS (L.) Spring. Dry, rocky soil; frequent at least locally; Winneshiek and Dubuque Counties.

ISOETACEAE

ISOETES MELANOPODA J. Gay. This species has been collected in Clinton County.

BETHANY, NEBRASKA.

Pellaea microphylla Mett. ex Kuhn

C. A. WEATHERBY

One of the rare ferns of the United States is the little plant ranging from southwestern Texas to southeastern Arizona, which has passed for many years as *Pellaea pulchella*. So rare is it that there are in the Gray Herbarium only four sheets from north of the Mexican border and those were collected by Wright and Bigelow between 1849 and 1851. In Mexico, Pringle and Palmer have found it at a few places in Chihuahua and Coahuila. Late collections reported by Wooton and Standley[1] from New Mexico and by E. J. Palmer[2] from Texas add new stations, but do not materially extend the local and restricted range of this plant.

Wright seems to have made the first collection in 1849. When his specimens reached Europe and began to be studied there, Hooker referred this plant to the Mexican *Pellaea pulchella* and cited it under that name in the Species Filicum. Mettenius was of a different opinion and described it as a new species. Baker, somewhat impressed by Mettenius' view, treated it as a variety of *P. pulchella*[3], and Christensen follows this reference in the Index Filicum. Eaton commented on the matter as follows:

"Among the ferns named by Mettenius and published after his decease by Kuhn, is *Pellaea microphylla*, which name was bestowed upon the northern specimens of the species above described [*P. pulchella*] to distinguish them from the Mexican form, the distinction being, according to Kuhn, that the Northern plant has 'furrowed rachises, and the ultimate pinnules smaller, and cordate.' The difference in form and size of the pinnules is too slight to be noticed; but our specimens certainly have the rachises slightly sulcate, or furrowed; and no furrowing is visible on the Chiapas specimens, which are, moreover, considerably taller and heavier

[1] Cont. Nat. Herb. 19: 24. 1915.

[2] In a paper on Texas ferns soon to be published in the JOURNAL.

[3] Syn. Fil. ed. 2, 477. 1874.

than our form. But I am as yet unwilling to admit that the difference in size, etc., and in the terete or furrowed rachises, amounts to a valid specific distinction."[4]

He therefore reduced *P. microphylla* to a synonym of *P. pulchella* and, so far as I am aware, has been followed by all American authors who have had occasion to deal with the plant, up to the present time.

Yet there are other differences than those noted by Kuhn and Eaton (which by themselves would indeed be hardly sufficient to constitute a species). These may be summed up thus:

P. microphylla	*P. pulchella*
Basal scales about 6 mm. long, more or less crisped in drying, *glabrous*.	Basal scales 8–10 mm. long, thicker, not crisped in drying, *viscid*.
Stipe and rachises *bright red-brown, very slightly or not at all glaucous*, shallowly channeled on the upper side.	Stipe and rachises *dark brown, conspicuously glaucous*, terete or bluntly triangular in cross-section, not channeled.
Ultimate pinnules *very broadly ovate or orbicular, 2–4 mm. long, very nearly or quite as wide*, more or less cordate at base, the margin revolute over the sporangia when young, in well-developed mature fronds spreading and plane.[5]	Ultimate pinnules *oblong* or narrowed gradually from the sub-truncate to cordate base to a blunt point, *3–5 mm. long, 2–3 mm. wide, ½ to ⅗ as wide as long*, the fertile with the margin apparently permanently revolute over the sporangia, the sterile in young plants sometimes plane and orbicular.

All of the above-noted characters are wholly constant in the material examined. The most striking and remarkable of them is found in the viscid scales of

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[4] Ferns of N. Am. **1**: 83. 1878.

[5] The measurements and description of the pinnules were taken mostly from mature plants evidently growing under favorable conditions when collected, in which the pinnules were spread out quite flat. In other specimens, either from poor pressing or because the plants were in a dried-up state before collection, not merely the margin, but the whole pinnule is so inrolled that its outline cannot be seen except by boiling out.

P. pulchella. In all the Gray Herbarium specimens numerous particles of earth and the like small objects are adhering to them, and the scales themselves, when boiled out, will still, after years of desiccation, stick to the dissecting needle. This is a character not found in any other species of Pellaea, so far as I am aware, and one not at all common among ferns.

In addition, *P. pulchella* is, as Eaton noted, ordinarily a notably larger plant than *P. microphylla*. In the material examined, the fronds of the latter ranged from 10 to 23 cm. in height, averaging slightly over 16; those of the former from 15 to 35 cm., averaging 26. The fronds of *P. pulchella* are, also, generally more compound. Both plants, so far as collectors' labels show, inhabit limestone ledges, but their ranges are wholly different. *P. microphylla* is confined to the arid regions of Texas, New Mexico, Arizona, and adjacent Mexico. *P. pulchella* occurs further south, from San Luis Potosi to Chiapas. Taking everything together, there can be little doubt that the two plants represent two closely related, but clearly and definitely distinct, species.

In the case of *P. microphylla*, a nomenclatorial question arises. It was published in *Linnaea* **36**: 86 (1869). In the same year Fée published another *Pellaea microphylla* in his *Cryptogames Vasculaires du Brésil*. However, from data very kindly furnished me by Miss Mary A. Day, of the Gray Herbarium, there can be no doubt that the Mettenian publication was the earlier. *Linnaea* was issued in parts. The issue of part 1 of volume 36, which, as shown by printers' marks and remnants of the original cover in the Gray Herbarium copy, comprised pages 1–128, is noticed in the *Botanische Zeitung* for Sept. 10, 1869. It must, therefore, have appeared before that date. The preface of Fée's *Cryptogames Vasculaires du Brésil*, on the other hand, is dated

7 Nov., 1869, and the work could not have been published until after that date.

The synonymy of the two species and a list of specimens examined (all in the Gray Herbarium) follows:

PELLAEA MICROPHYLLA Mett. ex Kuhn. Linnaea **36:** 86. 1869.

P. pulchella Eaton Ferns N. Am. **1:** 81, pl. 11, 1878, and American authors, at least in part, not Fée.

TEXAS: 1849, *Wright* 824 in pt., 825. 1851, *Wright*, 2132.[6]

ARIZONA: Head of Rio San Pedro, Nov. 5, 1850, *Bigelow*.

CHIHUAHUA: Limestone ledges, Santa Eulalia Mts., March, 1885, *Pringle* 440. Santa Eulalia Mts., 2 Nov., 1885, *Pringle* 458.

COAHUILA: San Lorenzo Canon, 6 miles southeast of Saltillo, Sept. 21 23, 1904, *Palmer* 404. Mts. 6 miles east of Saltillo, July, 1880, *Palmer* 1423. Lerios, 45 miles east of Saltillo, July, 1880, *Palmer* 1424.

PELLAEA PULCHELLA (Mart. & Gal.) Fée, Gen. Fil. 129. 1852.

Allosorus pulchellus Mart. & Gal. Mém. Acad. Brux. **15:** 47, pl. 10 f. 1. 1842. Not *Allosorus pulchellus* Presl, 1836, which is a Cheilanthes. *Allosorus formosus* Liebm. Vid. Selsk. Skr. V. **1:** 220 (repr. 68). 1849.

SAN LUIS POTOSI: Limestone ledges, San Jose Pass, 16 Aug. 1890, *Pringle* 3401. Minas de San Rafael, June, 1911, *Purpus* 4882[a].

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[6] The localities of these Wright collections are uncertain. The Gray Herbarium sheet of No. 825 (the type collection of *P. microphylla*) gives no collection number. The collection number for No. 824 is apparently wrong, since it refers, in Wright's MS list, to a plant which is not a fern at all. To add to the confusion, specimens of *Cheilanthes aspera* were also distributed under No. 824. Two collections are included under No 2132, one from "hills of the San Pedro, May 24, 1851," the other from "high, stony hills of the Pecos, June 1, 1851." The first locality is in Arizona, the second in Texas: any given specimen of that number may be from either state.

VERA CRUZ: Region d'Orizaba, Escamela, 16 Aug., 1866, *Bourgeau* 2894.

CHIAPAS, "etc." 1864–1870. *Ghiesbreght* 227.

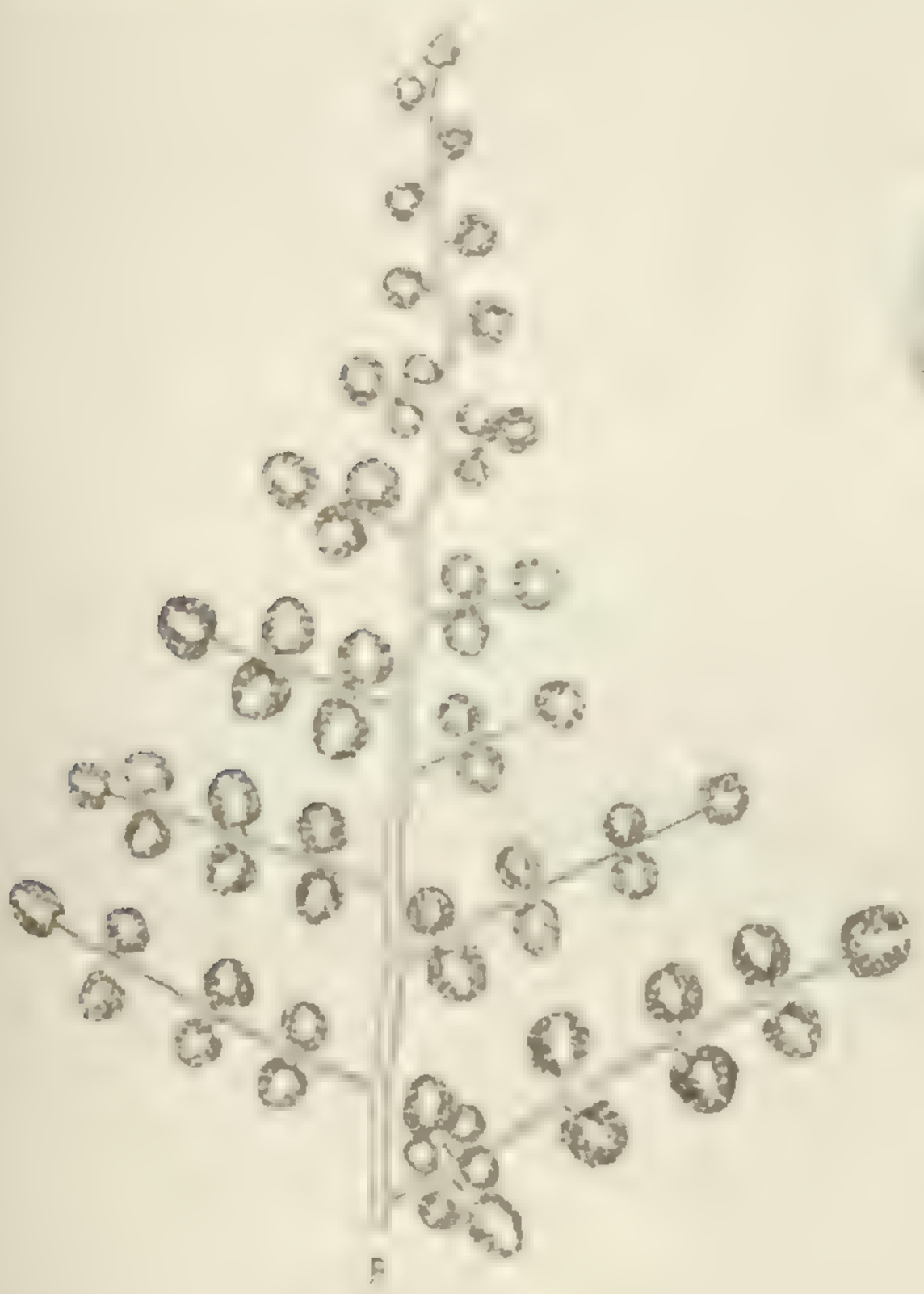
OAXACA: Cerro San Antonio, 1600 m., 20 May, 1906, *Pringle & Conzatti* 1395.

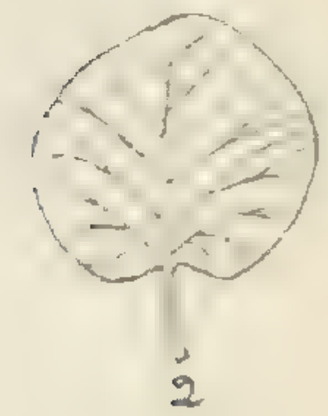
It is interesting to note that in the "Reliquiae" Kuhn published Mettenian descriptions of three species of Pellaea—*P. intermedia*, *P. glabella* and *P. microphylla*. The first, after a brief period of obscurity, came into its own. The work of Mackenzie and Bush, Pickett and Butters has recently established *P. glabella* as beyond question a distinct species. Now, with the gathering of more and better material, it is clear that *P. microphylla* must take its place beside them —no small tribute to the keenness of eye and good judgment of Mettenius in distinguishing species from meager material.

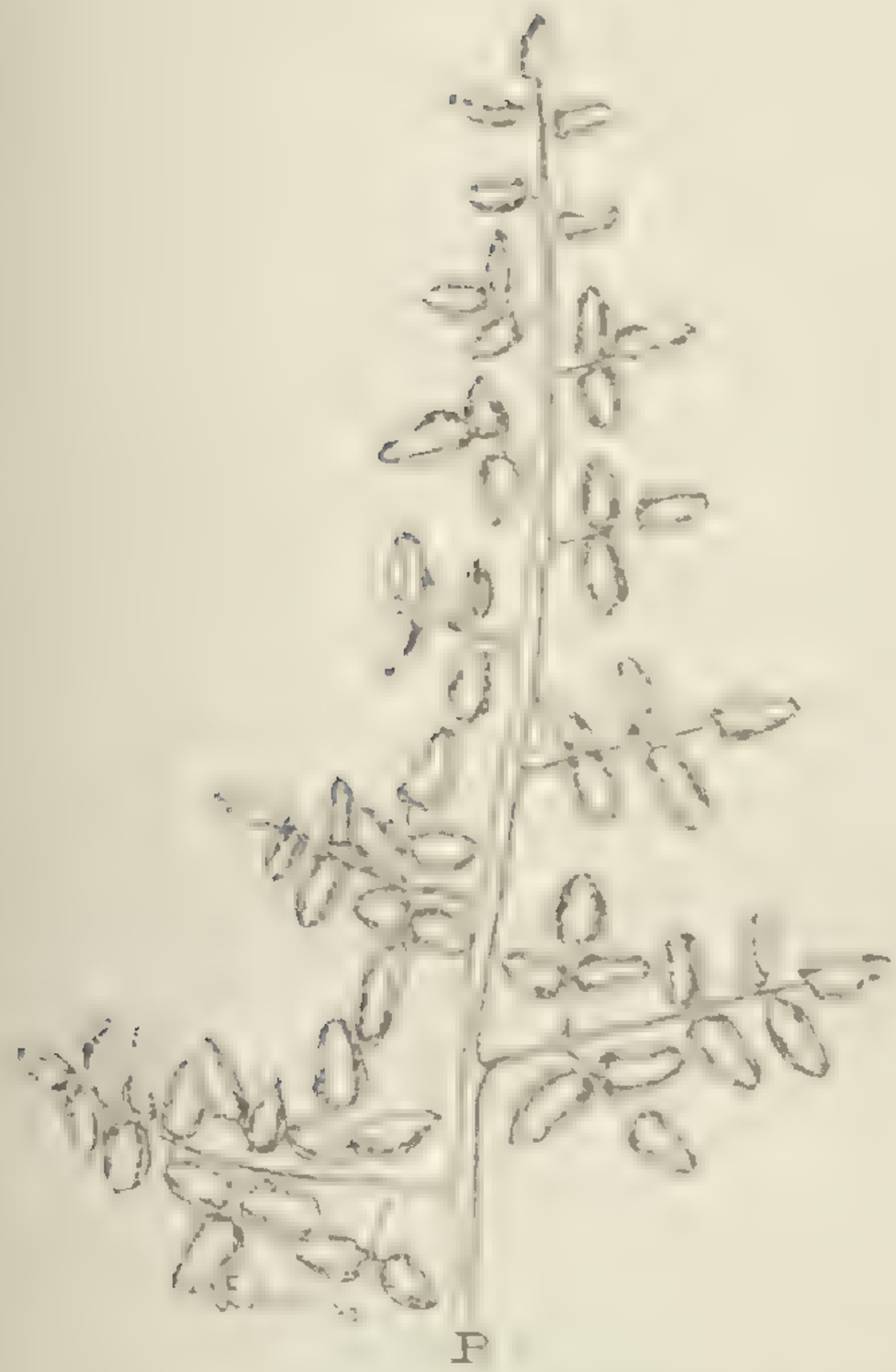
I am much indebted to Mr. William R. Maxon for his courtesy in turning over to me certain of his notes on the two species here discussed, whose distinctness he had recognized independently and before me; and for reading the manuscript of this paper.

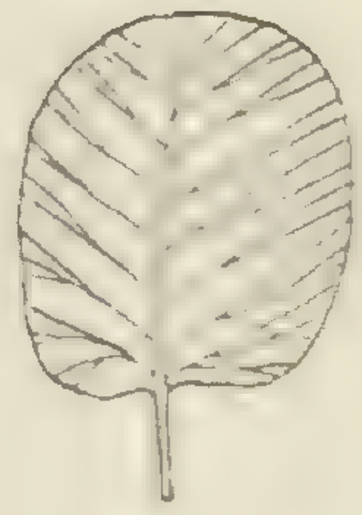
EXPLANATION OF PLATE 5. A. *Pellaea microphylla*, tip of frond ×1. Fig. 1, mature fertile pinnules; fig. 3, young fertile pinnule; figs, 2 and 4, sterile pinnule: all ×4. *B. Pellaea pulchella*, tip of frond ×1. Figs. 5 and 6, fertile pinnules; fig. 7, young fertile pinnule; fig. 8, sterile pinnule: all ×4. The figures of *P. microphylla* were drawn from *Pringle* 458; those of *P. pulchella*, fertile from *Pringle & Conzatti* 1395, sterile from *Purpus* 4882a.

EAST HARTFORD, CONN.









PELLAEA MICROPHYLLA AND P. PULCHELLA

A Crested Fern Used in Landscape Planting

F. G. FLOYD

Several years ago a dwarf crested fern was submitted to me for identification. The material was quite meager and the specimens were not well made and, on account of having been collected late in the season, the sori and indusia were not particularly well preserved. On account of the poor material I was unable to satisfactorily establish the identity of the species at the time, but it seemed to be a form of *Asplenium Filix-femina* (L.) Bernh. The plant was collected at West Rock Park, New Haven, Conn., and was reported as abundant.

Nearly all of our native ferns are known to produce crested forms occasionally, but with the exception of certain species that are provided with stoloniferous running rootstocks, these crested forms are found as isolated single plants and not in colonies nor in any abundance over considerable areas. In 1898 I discovered *Dicksonia punctilobula* (Michx.) Gray[1] with forked and crested fronds in the Blue Hills, Milton, Mass., and in 1904 the late Mr. George E. Davenport and myself visited the station at Sudbury, Mass., and collected a crested form of *Aspidium Thelypteris* (L.) Sw.[2] These two species are of the stoloniferous type. At each of these stations the fern had spread by means of the creeping rootstock until it occupied an area of at least one hundred square feet almost to the exclusion of the normal form. In rambling over New England in search of flowers and ferns I have found many crested or otherwise abnormally divided forms of ferns, but in all my experience, extending over a period of more than twenty years, except at the two above-mentioned stations at Milton and Sudbury, I have never found at

[1] Forma *cristata* (Maxon) Clute. Fern Bull. **7:** 63; Rhodora. **2:** 220.
[2] Forma *Pufferae* (A. A. Eaton) Robinson. Fern Bull. **10:** 78.

any one station more than a single solitary crested plant. *Asplenium Filix-femina* has no creeping root-stock, being furnished with an upright or decumbent rhizome. From my experience with these plants, therefore, it was natural to expect that if a crested form of *Asplenium Filix-femina* was found, there would be one plant only. Consequently, the reported abundance of a crested fern from West Rock, supposedly this species, excited my curiosity, and when an opportunity presented itself I visited the Park for the purpose of investigating.

I entered at the southwest corner crossing West River and proceeded along a well-kept roadway bordered by a low second growth for the most part of native trees and shrubs. The margin of the roadway had evidently been cleared of all growth and replanted with shrubs, some of which were not native species. Proceeding a short distance, I found in this replanted strip a few plants of the crested form I was looking for and, after satisfying myself that the plant was in reality *Asplenium Filix-femina*, I proceeded to make a careful search to determine its abundance. I found plants everywhere along this roadway but always singly, sometimes a foot or two apart and again ten feet or more away from each other. They were always in the replanted strip and never more than ten feet from the paved gutter of the graded roadbed. When I penetrated further from the road into the uncleared second growth I found plenty of plants of the usual tall, perfectly normal *Asplenium Filix-femina*, but none of the dwarf form. Walking slowly along the roadway for over half a mile I counted the plants observed until the figure reached more than two hundred. I continued for about half a mile further and estimated I saw some five hundred plants of the dwarf crested form in the total distance covered and there were many others

beyond the point where I turned and retraced my steps. There was considerable variation in the stature, shape of blade, and cutting of frond, ranging from about four to eighteen inches in length, from lanceolate to ovate-lanceolate and from simple bifurcate to compound crested.

Here was something new in my experience; *A. Filix-femina*, a non-stoloniferous fern, with crested plants in abundance, and I was puzzled to account for it. I had established four facts; the identity of the fern as a form of *Asplenium Filix-femina*; its abundance as considerable; that it was found only in the replanted strip; and the presence of several recognizably different things all abnormal.

In seeking an answer to this puzzle it is evident that the phenomenon might be accounted for as the result of natural or artificial introduction. The late Mr. Charles T. Druery, exponent of the cult of English fern hybridists, has demonstrated that freak ferns reproduce themselves from spores in cultivation. It might be possible to account for the abundance of the form at West Rock Park through natural means, although not in accord with my observations on other wild species. If, however, this form was reproducing itself naturally, it was not apparent why it should be found exclusively in the replanted area and not in the natural, wild, uncleared second growth. Because of this incongruity of position and also on account of the extent and the regular interval maintained between the plants, I was inclined to adopt the hypothesis of artificial introduction. I was deterred from accepting absolutely this theory because of the factor of precedent involved. I had never known an instance of such an insignificant plant as this dwarf crested form of Asplenium being used extensively in landscape planting. After consideration, the weight of the evidence, to my mind,

seemed to indicate artificial introduction rather than natural reproduction from spores and there the matter was allowed to rest for a time.

I have recently received the following letter from the President of the Department of the Public Parks of New Haven, which confirms my suspicion of intentional introduction:

New Haven, Connecticut,
February 13, 1918.

Dear Mr. Floyd:

In reply to your inquiry I beg to say that Mr. Amrhyn, Superintendent of Parks for a number of years, tells me that he set out a dwarf fern both at East and West Rock Parks for several years in succession in quantity. It must be this to which you refer, although the locality does not exactly correspond to your description. If you wish further information perhaps I could elicit it by sending your letter to the University Professor of Botany, which I will do if you say so. But clearly these dwarf ferns were planted.

Yours truly,

T. S. Woolsey.

This evidence seems to settle beyond a doubt that the form in question was actually artificially introduced and was designed to form part of the Park planting scheme.

This crested form has been detected by others at West Rock Park and at East Rock Park. In the Gray Herbarium there is a sheet bearing this label, "*Athyrium Filix-femina*, var. *corymbiferum*, forma *strictum* Druery [det. B. L. R.]. East Rock and Mt. Carmel, near New Haven, Conn. Coll. Miss Mary G. Miner. Comm. Sept. 12, 1906." The specimens match many of the plants I saw at West Rock Park. On this sheet a note has been added by Prof. F. K. Butters, "A *form of true European* A. *Filix-femina*." In Prof. Butters's paper on the American lady ferns[3] it is shown that the true European *Filix-femina* is not found wild in New

[3] Rhodora. 19: 169.

England. He says "that in the eastern United States and Canada there are two distinct species of lady ferns, neither of which is conspecific with *A. Filix-femina* (L.) Roth, of Europe."[4] If, therefore, *A. Filix-femina* is not a native New England species, and if these crested plants found growing so abundantly at West Rock Park are true European *A. Filix-femina*, it follows that they were planted there.

This then seems to be the answer to the riddle: that, strange as it may seem, this dwarf crested form of lady fern, found well established in such abundance at West Rock Park, has not originated there naturally from spores but has been introduced by the city authorities as a definite part of the planting scheme, and shows every indication at present of maintaining itself indefinitely.

WEST ROXBURY, MASS.

Notes on American Ferns—XII[1]

WILLIAM R. MAXON

THE SYSTEMATIC POSITION OF PELLAEA DENSA.—Under the name *Onychium densum* and on the basis of very scant material from the Rogue River region of southwestern Oregon, Brackenridge described, in 1854, the peculiar but now well known fern usually called *Pellaea densa*. It has been placed under Cryptogramma by Diels, but in every essential character this latest reference is unsatisfactory. Actually the plant is of very close relationship to *Cheilanthes californica*, despite D. C. Eaton's comment concerning the latter species that "there is no other North American fern which it resembles even slightly."[2] At first sight the

[4] l. c. p. 179.

[1] Published with the permission of the Secretary of the Smithsonian Institution.

[2] Ferns N. Amer. 1: 46. 1878.

continuous, linear indusium, common to the very numerous contiguous sori associated in a narrow, intramarginal line, would seem to offer sharp distinctions to the soriation of *C. californica*, in which the sori are almost invariably solitary, having each a separate, short, roundish-lunate indusium attached at the transversely enlarged vein-tip to a slender, almost saccate marginal tooth on either side; but it will be found that the modification of leaf margin is similar in both species, and that the greater prominence of the marginal teeth in *C. californica* and the development of solitary sori in this species are characters directly correlated with the greater dissection of the lamina. The fronds of *Pellaea densa* are nearly always completely fertile, with long, subentire, linear segments; but in the rare semifertile fronds (these having serrate segments) or even in occasional wholly fertile specimens with unusually short segments the sori may be interruptedly continuous, with the indusia lobed, correspondingly, or even discontinuous. Some such specimens have actually been determined as *C. californica*. In habit, rhizome scales, absence of paleaceous or hairy covering of lamina, and development of a true membranous indusium the two species are strikingly alike and are undoubtedly congeneric. Their proper generic reference is not so clear, however. In the characters just enumerated they are at variance with a majority of the species of Cheilanthes, as that genus is now regarded, yet there are several species variously referred to either Cheilanthes or Pellaea to which they are closely akin, the whole assemblage perhaps constituting a separate genus. Thus, *Cheilanthes californica*, the type of Nuttall's unpublished genus Aspidotis, is closely similar to the African *C. Schimperi* Kunze, and *Pellaea densa* is no less closely related to the Himalayan *Cheilanthes nitidula* Hook. and the Mexican and Central American *C. intra-*

marginalis Kaulf. The last-mentioned plant is the type and sole species of Mildella, a genus proposed by Trevisan,[3] reduced to Pellaea by Christensen. If Mildella were to be recognized as distinct it should probably include (besides those mentioned above) a few tropical species, for example, the group of *C. marginata*. Pending a critical review of the whole group it seems preferable, however, to regard Mildella as a subgenus of Cheilanthes. This requires the transfer of *Pellaea densa* to Cheilanthes and, unfortunately, the assignment of a new species name, because of the earlier *Cheilanthes densa* Fée, 1852. The plant may be known, therefore, as **Cheilanthes siliquosa**, in allusion to the silique-like form of the narrowly elongate segments. The synonymy is given below.[4]

Cheilanthes pyramidalis arizonica Maxon, subsp. nov.—Rhizome oblique or short-decumbent, coarsely radicose, freely paleaceous upon and among the bases of the crowded stipes; scales ascending, linear-attenuate, 4–5 mm. long, about 0.5 mm. broad at the base, dark castaneous, opaque, nearly concolorous, rigid, the aciculiar apices fragile, subentire. Fronds several, fasciculate, 15–28 cm. long; stipes 8–17 cm. long, fragile, lightly flexuous, castaneous naked above the base; lamina deltoid-ovate, subpentagonal, 7–13 cm. long, 4–10 cm. broad, subquadripinnate, all the rachises but the glossy castaneous basal parts of the primary and larger secondary ones very narrowly greenish-marginate; pinnae laxly ascending or the basal ones projected forward.

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[3] Rend. Ist. Lombardo II. **9**: 810. 1876.

[4] **Cheilanthes siliquosa** Maxon, nom. nov.

Onychium densum Brack. in Wilkes, U. S. Explor. Exped. **16**: 120. *pl. 15. f. 2.* 1854.

Pellaea densa Hook. Sp. Fil. **2**: 150 *pl. 125.B.* 1858.

Allosorus densus Kuntze, Rev. Gen. Pl. **2**: 806. 1891.

Cryptogramma densa Diels in Engl. & Prantl, Nat. Pflanzenfam. **1**[4]: 280. 1899.

all the divisions and segments oblique, distant; segments mostly fertile, 3–7 mm. long, narrowly elliptical, pointed-elliptical, or oblanceolate (rarely linear), narrowly cuneate, their bases as broad as the greenish-marginate ultimate rachises; sori intramarginal, borne upon the swollen nearly punctiform vein-tips, few-sporangiate, adjacent, confluent, not extending to the base of the segment, with a common proper indusium formed of the broadly reflexed, delicately membranous margin, the vein-tips evident without in the sinuses of shallow crenations at the base; indusia ample, often meeting at the middle of the segment, not decurrent upon the rachises, translucent the margin delicately glandular-papillose or papillose-denticulate. Leaf tissue delicately membranous, sometimes minutely granular-crustaceous near the vein-tips above and on the lower part of the indusium, beneath beset with numerous, oblique or appressed, very minute glandular hairs, these usually wine-colored and appearing resinous.

Type in the U. S. National Herbarium, No. 692694, collected on the steep moist slopes of Ramsey Canyon, Huachuca Mountains, southeastern Arizona, August 28, 1912, by L. N. Goodding (No. 1327). Represented also by other specimens collected at the same place by Professor Goodding (No. 760) and by specimens collected in August, 1882, in Conservatory Canyon, of the same mountains, by Lemmon, all distributed as *Pellaea marginata*, a South American species which barely reaches North America. While amply distinct from typical Mexican *C. pyramidalis*, the Arizona plant seems, nevertheless, to intergrade imperceptibly with larger but similarly decompound Mexican forms of more robust and upright habit through specimens collected in Chihuahua (*Palmer* 446; *Pringle* 1442), these necessitating its recognition as a subspecies merely. *Cheilanthes pyramidalis*, as represented in ample col-

CHEILANTHES PYRAMIDALIS ARIZONICA MAXON

lections from widely diverse regions of Mexico and Guatemala, embraces other puzzling, closely interrelated forms. These and the present plant will be discussed subsequently, together with *C. angustifolia* H. B. K., *C. cuneata* Link. *C. chaerophylla* (Mart. & Gal.) Kunze, *C. marginata* H. B. K. and **C. membranacea**[5] in their relation to *C. intramarginalis* Hook., the type of Mildella.

EXPLANATION OF PLATE 6.—Fig. 1, sterile and fertile frond. Fig. 2, pinnule with the indusium removed, showing soriation. Fig. 3, pinnule, showing indusium. Fig. 4, scale from rootstock. Fig. 5, scale from bud. Fig. 6, sporangium.

[Owing to limited material available at the time the drawing was made, the fertile frond figured is somewhat smaller and less compound than is usual in this subspecies.—C. A. W.]

WESTERNMOST STATIONS FOR CHEILANTHES FEEI.—This species, while exceedingly common in the Mexican border region from central Texas to Arizona and widely distributed in the central and western parts of the United States, is nevertheless very rare in the states of the Pacific coast. In addition to the station at Almota, southeastern Washington (*Piper*) and the recent record from the Providence Mountains, San Bernardino County, California, (*Parish*,[6] only the following material is known to the writer: Mountain Spring, western border of the Colorado Desert, San Diego County, California, altitude 600 meters, May 12, 1894, *Internat. Bound. Comm.* 3080 (*Schoenfeldt*, coll.).

THE ALPINE LADY FERN.—In a recent paper upon the genus Athyrium, with particular reference to the North American forms referred or related to *A. filix-foemina*,[7] Butters has described an American variety (var. *americanum*) of the Old World *A. alpestre*, pointing out as essential characters that "it differs in having

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[5] *Pellaea membranacea* Davenp. Bot. Gaz. **21**: 262. *pl. 18 f. 5, 6.* 1896.

[6] Bot. Gaz. **65**: 334. 1918.

[7] Rhodora **19**: 169–207. *pl. 123. text figs. 1–5.* 1917.

the ultimate segments of the frond conspicuously narrower and more widely separated from one another, and the sori even smaller than in the type . . ., submarginal, and protected by a reflexed tooth of the pinnule," and adding that "careful search has failed to disclose any vestige of indusium in the American material." Because of an approach which a few specimens are held to show "to the European form in the cutting of the frond," the author regards the American plant as a "geographical variety rather than a species," despite the complete suppression of indusia in all American specimens. An examination of the very ample material in the National Herbarium, however, including some of the numbers cited by Butters as intermediate in leaf cutting, reveals no specimens which are truly intermediate in this or other respects, the extremes in "leafiness" among the American specimens being no greater than may reasonably be attributed to partial sterility or to favorable or adverse conditions of habitat. The American material is essentially uniform in all respects save size, and since it differs constantly from the European plant it should rank as a distinct species, **Athyrium americanum**.[8] The invariable absence of reduced indusia, which might be regarded as an inconsequential point if the plants were otherwise like the European, is a substantiating character of some worth; but disregarding this feature, the plant is different enough in gross characters to warrant separation. The conspicuously narrow, oblique, widely separated segments give it a strict, singularly skeleton-like aspect widely different from that of the leafy European plant,

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[8] **Athyrium americanum** (Butters) Maxon. (*Athyrium alpestre americanum* Butters, op. cit. 204.)

No type specimen having been designated by Butters, the following collection, represented in both the Gray and National Herbaria, may be regarded as the type: Rogers Pass, British Columbia, alt. 1320 meters, Aug. 23, 1904, *E. R. Heacock* (in Shaw's "Selkirk Flora") 554.

which has the segments spreading and more broadly attached; and the oblique, elongate-deltoid pinnae (with the basal pinnules often greatly produced) are equally at variance from the spreading, oblong-acuminate pinnae of the European species. The range "Alaska and British Columbia to California and Colorado; also in Gaspé County, Quebec" must be extended to include Nevada, an especially luxuriant specimen recently received having been collected at Candle Creek, Pole County, Nevada, altitude 2570 2630 meters, August 18, 1917, by W. W. Eggleston (No. 14135).

Washington, D. C.

A Year's Collecting in the Northeastern United States

E. P. KILLIP

Between the middle of August, 1916, and the middle of August, 1917, it was my good fortune to botanize in certain very interesting fern regions in the northeastern part of the United States. These localities have been frequently visited and often described by botanists, but possibly a brief account of the places and of the ferns collected will not be without interest at this time.

Cape May and the New Jersey Pine Barrens

During the latter part of August, 1916, M. S. Baxter and M. E. Woodams, of Rochester; Joseph G. Taylor, of the Department of Biology, New York University; and myself, made a trip to the Cape May peninsula, the southern extremity of the State of New Jersey, and to Hammonton, in the heart of the pine barrens. Although the many species of grasses, sedges, and flowering plants to be found in these regions made the bulk

of our collections consist of these groups, the few ferns and fern allies we gathered were of very great interest.

The best "hike" which our guide, Mr. O. H. Brown, took us on led through the sandy bogs of Cold Spring and Bennett, a few miles north of the city of Cape May. The appearance of one of these bogs at Bennett will ever remain before our eyes. It was almost pure white with the rare orchid *Habenaria nivea*, with occasional patches of *Sabatia lanceolata*, *Lachnanthes tinctoria*, and *Xyris elata*. Closer inspection of the soil revealed *Lycopodium alopecuroides*, *L. inundatum* var. *Bigelovii*, and the tiny *L. carolinianum*. In a ditch running through the bog was *Isoëtes Engelmanni*.

Another short trip to Cape May West netted us *Woodwardia areolata*, found along roadsides, and *Botrychium obliquum* var. *dissectum*.

At Hammonton, in the central part of the state, Mr. George W. Bassett was our guide. We drove some ten miles north of the village finding *Asplenium platyneuron* and *Woodwardia virginica* on the way, left our rig and walked down the Atsion River, the banks of which, for a distance of some five miles, were lined with *Lygodium palmatum*. Farther along the road we came to a peat bog where, after several moments of steady gazing at a spot indicated by our guide, we saw for the first time the curled fronds of *Schizaea pusilla* with the erect fertile portion. *Lycopodium carolinianum* was also here. We were very chary about gathering much *Schizaea*, as it seemed very scarce. The next day, however, Mr. Bassett took us to a spot where the little hillocks in the bog were completely covered with splendid plants of this rare fern. We surely took our fill of specimens and photographs.

In July, 1917, I made another trip of a few days to both Cape May and Hammonton, but it was mainly to collect the earlier grasses and sedges. I certainly

want to take this opportunity of thanking Mr. Brown and Mr. Bassett for all they did to make both of these trips most enjoyable and profitable.

Central New York

In June, 1917, Dr. H. D. House, the New York State Botanist, and I made an auto trip through the central portion of the state, chiefly for the purpose of studying the flora of cedar swamps. As our trip included a brief stop at Jamesville, it was not entirely without interest from a fern standpoint. As the Green and Blue Lake region has been so often described, I will pass over this very interesting locality, merely recording that we collected *Scolopendrium vulgare*, *Camptosorus rhizophyllus*, *Asplenium Trichomanes* and *Polypodium vulgare*.

A few other ferns gathered on this trip are worth mentioning. *Aspidium simulatum* we found at Sylvan Beach on Oneida Lake; *Botrychium lanceolatum* var. *angustisegmentum* occurred in a deep woods near Taberg, Madison County; and *Lycopodium inundatum* we collected in a sphagnum bog at Lily Marsh, Oswego County.

The Adirondack and Green Mountains

Five members of the Rochester Academy of Science, Messrs. Baxter, Boughton, Matthews, White, and myself, left Rochester one morning in July, 1917, on what was to be a most pleasurable auto trip through the north country. Swinging around by way of Oswego, Watertown and Malone, we entered the Adirondacks from the north and made our headquarters at the Wood farm, just south of Lake Placid, the last outpost of civilization, before entering the Mt. Marcy wilderness. One day we spent in Keene Valley, walking up the Asuable Valley beyond St. Huberts. In the deep woods here we found *Polystichum Braunii* and *Botrychium*

lanceolatum var. *angustisegmentum*. On the rocky cliffs near Rainbow Falls were quantities of *Cryptogramma Stelleri*, *Cystopteris fragilis*, *Woodsia ilvensis*, and a very blunt-lobed form of this Woodsia which I have frequently noticed in mountain habitats. In Mossy Cascade, near St. Huberts, was found *Asplenium Trichomanes*. The only spots in the whole Adirondacks where I have chanced to encounter two ferns common in other sections of the state, *Aspidium marginale* and *Adiantum pedatum*, occur in these Keene Valley woods.

Three days were spent in a camping trip to the summit of Mt. Marcy, 5328 feet in altitude. The ascent was made by way of the Marcy Brook trail, the descent along the picturesque Opalescent River and through Avalanche Pass. The characteristic ferns of the dense woods of this region are *Phegopteris polypodioides*, *Aspidium spinulosum* and its varieties *intermedium* and *dilatatum*, and *Polypodium vulgare*. On the bare, rocky summit of Marcy. *Lycopodium Selago* and *L. annotinum* var. *pungens* are found. At Lake Tear-of-the-Clouds, the highest water in the state, *Lycopodium inundatum* grows. Avalanche Pass, with its perpendicular rocky sides, is surely a fern paradise. In the crevices of the rocks are clumps of *Aspidium fragrans*. with their withered masses of dead fronds; *Woodsia ilvensis* is everywhere; while occasionally you see the delicate little fronds of the very rare *Woodsia alpina*.

The peat bogs in the fields close to the Wood farm we found interesting with *Ophioglossum vulgatum*, *Botrychium ternatum* var. *rutaefolium*, and the rare orchid, ***Microstylis unifolia.***

Leaving the Wood farm the first of August, we drove east, were ferried across Lake Champlain, and made for the famous Smugglers Notch, Vermont. Over the roughest of roads and steepest of hills, we drove to Smugglers Notch Camp. A short hike and a climb

up high cliffs brought us into the heart of that wonderful flora. Here, in shady crevices of the rocks, we came upon the delicate plants of *Asplenium viride* and *Woodsia glabella*. *Woodsia ilvensis*, of course, was there, and in the woods at the base of the cliffs, *Polystichum Braunii*. The following morning I took a hike up to the summit of Mt. Mansfield, finding the fern flora much as on the Adirondack peaks—mostly stubby *Lycopodiums*.

We then struck east to the Connecticut River and followed this to Greenfield, Mass., calling upon various fern enthusiasts upon the way, one of whom was Mr. Underwood, the Treasurer of the American Fern Society. After a beautiful run over Hoosac Mountain and through the Berkshires, with a stop at Albany, we made for the Fulton Chain of Lakes in the southwestern part of the Adirondacks. The best finds here were *Aspidium simulatum* at Quiver Pond and some Aspidium hybrids; on the sandy shores of Otter Lake we came upon *Lycopodium inundatum* once more.

Western New York

Naturally, during the year covered by this article, I made frequent trips in the vicinity of Rochester. Ferns more or less common in this region, as well as in Central New York, are *Adiantum pedatum*, *Aspidium cristatum*, *A. cristatum* var. *Clintonianum*, *A. marginale*, *A. noveboracense*, *A. spinulosum*, *A. spinulosum* var. *intermedium*, *A. Thelypteris*, *Asplenium Filix-femina*, *Cystopteris fragilis* and *C. bulbifera*, *Onoclea sensibilis*, *O. Struthiopteris*, *Phegopteris Dryopteris*, *Polystichum acrostichoides*, *Pteris aquilina*, *Osmunda cinnamomea*, *O. Claytoniana*, *O. regalis*, *Botrychium virginianum*, *Equisetum arvense*, *E. hyemale*, *E. fluviatile*, *E. sylvaticum*.

Ferns that I found in less abundance in Western New York were *Camptosorus rhizophyllus*, *Asplenium*

Trichomanes, and *A. platyneuron* at Lime Rock, Genesee County; *Asplenium acrostichoides*, *A. angustifolium*, *Aspidium Goldianum* and *Phegopteris hexagonoptera* at Jenkins Woods, Pittsford; *Woodwardia virginica* at Mendon; *Aspidium Boottii* at Bergen; *Botrychium lanceolatum* var. *angustisegmentum* and *B. ramosum* at Castile; *Ophioglossum vulgatum* at Pittsford; *Equisetum scirpoides* and *E. variegatum* north of Rochester; *Selaginella rupestris* near East Rochester. *Dicksonia punctilobula*, a very common weed in central and eastern New York, is very scarce near Rochester, so far as I know only one small patch occurring in that vicinity.

On these trips I collected quite a large number of duplicate specimens, and if any members of the Fern Society wish to exchange with me, I shall be very glad to do so.

ROCHESTER, N. Y.

American Fern Society

The Secretary has received word of the death, on October 21, of Mr. Raynal Dodge. We hope to have a more extended notice of his life and work in the next number.

Prof. Frank T. McFarland, 703 South Limestone Street, Lexington, Ky., would like to get a copy of Christensen's Index Filicum. Can any of the members tell him where one can be obtained?

For the two plates in this number, the JOURNAL is indebted to Mrs. Una F. Weatherby, who has very kindly drawn and presented them to us.

The following officers have been elected for 1919, in all cases by nearly unanimous votes: President, Mr. William R. Maxon; Vice-president, Mrs. Mary A. Noble; Secretary, Mr. Stewart H. Burnham; Treasurer, Mr. J. G. Underwood.

NEW MEMBERS:

Bear, Mrs. Charles U., 142 Putnam Ave., Detroit, Mich.
Poyser, W. A., 207 South 37th Street, Philadelphia, Pa.
Wherry, Edgar T., Bureau of Chemistry, U. S. Dept. of Agriculture, Washington, D. C.

CHANGES OF ADDRESS:

Newman, Rev. S. M., R. D. 8, Brookfield, Conn.
Satchwell, Mrs. M. W., Ortega, Fla.

Letter postage is still three cents and nearly everything else has gone up except the Society's income. The Treasurer therefore asks that, in order to save expense, members will send their 1919 dues to him without waiting to receive a bill.

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